Editorial

IT seems fairly certain that new PMG regulations are about to be issued concerning the operation of amateur transmitting stations. This much has already been announced through the ABC and unofficially confirmed through other sources.

Two items of interest which will be covered are first the granting of higher power, which almost certainly means one 100-watt licence instead of the present two licence classes carrying 50 and 100-watt permits respectively, and secondly the use of Pulse and F.M. transmissions.

Concerning the higher power, there has always been every reason why this should be granted. The two-licence system has served little purpose, has been almost impossible to administer, and equally impossible to enforce. It is hard to understand why the PMG ever undertook to handle things this way at all.

I have frequently put the view that the extra power will not appreciably affect the B.C.L. interference problem, and if it does, there is no justification for any amateur using the 100 watts. I consider there is an equal case for the granting of licences up to 500 watts to amateurs who can show that they can use this power as it should be used. I agree that the Chief Inspector must use his discretion in this matter as will all responsible people. It would not be a good thing for a newcomer, except possibly a man who is already qualified beyond the ordinary amateur standards. Our licences are experimental, and we should not be prevented from experimenting with higher power or any other aspect of communication.

The use of F.M. and Pulse transmissions must come, of course, but needs a good deal of thought to define the limits within which it shall operate. In this connection, the definition of power is only one of the things to be thought of, and no doubt this is one of the reasons why the power question has been delayed to allow all the above to be treated together.

From an experimental point of view F.M. transmission will probably be of the most immediate interest and value to the amateur. It will be particularly timely for those who have spent so much effort in learning something about U.H.F. technique. It is unlikely to be allowed on bands lower than 28 mc. and probably no lower than portion of the 50 mc. band.

It is certain, too, that the new Regulations will have been drafted in close co-operation with the Wireless Institute of Australia, which, after about 18 months of experience of post-war conditions, is in a much better position to state its case than it was before activities were actually under way.

All concerned must by this time be seized with the necessity for providing as wide a scope as possible for amateur work, and the necessity for avoiding clauses which in practice are irksome and contradictory. A number of amendments to the original set-up have already taken care of many such items, and these will of course be included in the new regulations.

Every amateur will be waiting with great interest for ultimate publication. It is evident by this time that amateur operating conditions are, in effect, the controlling factors in what will be the most important field of private research in radio. That alone is of vital import to the country and its technical future.

John Moyle

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ENGINEER LISTENS FOR SKY SIGNALS

RADIO Engineer Grote Reber listens for celestial messages. His medium is no crystal ball, but he does get some weird noises on the intricate radio receiver he designed, and which for several years has been installed in the backyard of his home in Wheaton, USA. This listening post not only serves him as a hobby, as when he trains his device at Mars and other stellar bodies to probe them for human intelligence, but is also the means through which he is conducting experiments on the measurements of electro-magnetic energy at radio wave-lengths arriving from the sky. Reber says he receives ultra-high frequency radio waves when he focuses on the Milky Way, the Sun and Mars. He doesn't expect to receive radio waves from Mars until January, 1948, but he does get a 16-hour daily report of radio activity transmitted from the Sun and other celestial bodies on a recorder chart (upper centre).

NEW RADIO SET WIRING METHODS

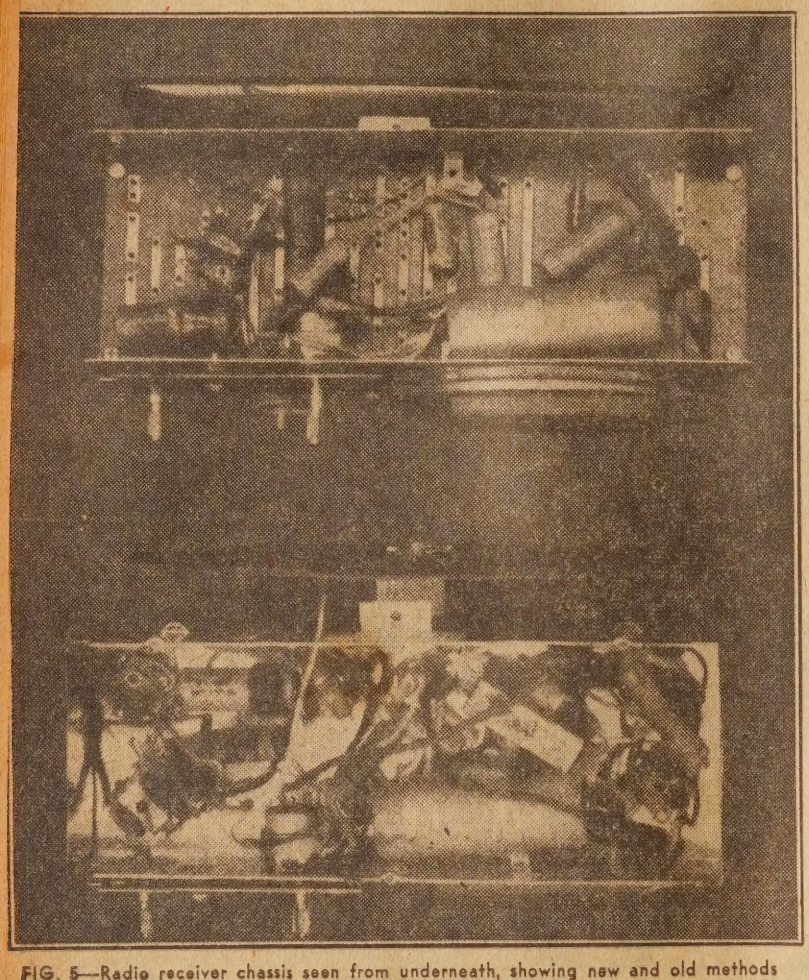


FIG. 5—Radio receiver chassis seen from underneath, showing new and old methods of wiring.

During the last few months, we have mentioned the possibility of a new technique in radio set manufacture, that of sprayed or stamped wiring, using metallized "paint" instead of wire. This article, largely drawn from "Electronics," gives some practical methodes of a type almost certain to revolutionise mass production.

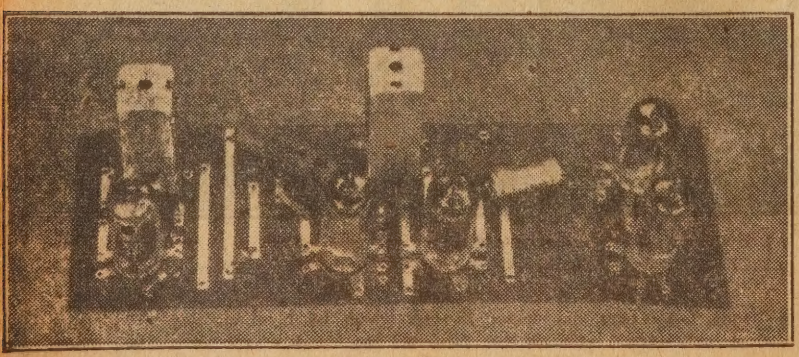


FIG. 4—Deck ready for insertion in metal chassis having cut-outs to admit tubes and transformers. The few flexible wires from chassis-mounted speaker, tuning capacitor, and other controls pass through cut-outs to stamped wiring deck pins, and are held in place by female connectors.

THE average radio receiver contains 150 soldered connections. Wires must be laboriously cut to length, skinned, and individually fastened in place. Modern television receivers frequently have over 500 connections, and some of the electronic control apparatus now finding its way into industry is equally complicated from a wiring standpoint.

For years engineers have worked to develop something resembling packaged wiring. Early electrical and electronic equipment used rigid busbar that was hard to handle and harder still to keep in place during shipment. This soon gave way to flexible wiring and cabling techniques, but even the latter required many individually soldered joints. During the war printed circuits came into use. Since then cast conductors somewhat reminiscent of processes tried in this country back in the 20's have been introduced in England.

A number of new packaged wiring ideas are in the experimental stage. Some are well along in development. One such idea involves stamped wiring, originated by A. W. Franklin, president of The Franklin Airloop Corporation of New York, which appears to lend itself to mass production methods since a basic wiring package can be turned out for manufacturers of many kinds of electronic gear. Alterations in the basic package are readily made by means of dies, so that 90 per cent. of the wiring within the average device can be stamped out. Furthermore, most component parts may be connected to the wiring in one operation by dip or induction soldering. Substantial savings in material, and in alignment and testing, as well as in assembly, seem likely.

BASIC CASE

Basically, stamped wiring consists of a thin sheet of insulation with a series of parallel conductors running in a horizontal direction on one side and a series of vertical conductors on the other side. Inter-connection between horizontal and vertical conductors is accomplished by punching through the insulation intervening between such conductors and then joining them by means of an eyelet or pin. A method of inter-connection which requires neither form of fastening, just pressure and heat, is also being developed.

Where connection to a single horizontal or a single vertical conductor is desired, without inter-connection, an eyelet or pin may be punched into the selected conductor at a point which causes it to miss metal on the reverse side. Where break-up of a single horizontal conductor or single vertical conductor into several horizontal or vertical conductors is required, this may be accomplished by

MAY REVOLUTIONIZE MANUFACTURING

the simple process of cutting the conductors at one or more points along their length or height.

Electronic equipment circuit diagrams consist essentially of horizontal and vertical lines, with crossovers and inter-connections. Stamped wiring consists of horizontal and vertical conductors, with the insulation between them constituting an inherent crossover, and eyelets, rivets or some other type of fastening providing inter-connection. Thus it is readily possible for an engineer-draughtsman to make the transition from schematic to stamped wiring drawing, as shown on the opposite page. Location of eyelets or pins, points at which conductors should be cut, and placement of parts is also planned at this time.

Such questions as the type of fastenings used for inter-connection of conductors, whether eyelets, pins, or the conductors themselves, are used as terminals for component parts, and whether short conductors are stamped out that way or produced subsequenly by stripping away unused metal from longer conductors are dependent upon what the equipment assembler wishes to buy, and upon what the supplier of packaged wiring ultimately finds it most desirable to deliver. Developmental work is still proceeding at a pace which suggests that such details will soon be standardised.

TYPICAL CASE

A typical stamped wiring deck developed for a 5-tube table-model radio having a conventional circuit is at present made as follows:

Sheets of single-x 1-16in. Bakelite punching stock, similar to that used in the manufacture of wafer-type tube sockets, are sheared to 3 x 9in. size.

A roll of 5-mil pure electrolytic-type oxygen-hydrogen-free copper, tinned on both sides, is coated on one side with US Rubber's Kotol thermoplastic cement.

Insulation and copper are fed to a 150-ton Standard automatic toggle press, containing a shearing and forming die. When the press is operated the die cuts the copper into conductors 5-32in. wide, with equal spacing between conductors, and presses their edges and ends 3-1000in. into the insulation. The die is heated electrically to 230 F. and softens the insulator sufficiently to facilitate locking of the conductors securely in place. The heat simultaneously sets the theromplastic cement so that the conductors are both mechanically locked and cemented to the insulation. The process is similar to that used in the manufacture of the Franklin "Airloop."

OPERATION OF PRESS

The press turns out some 20 decks per minute, with conductors on one side. (Conductors may eventually be placed on both sides at once by using upper and lower dies.) Both sides of a typical deck are pictured in Fig. 1.

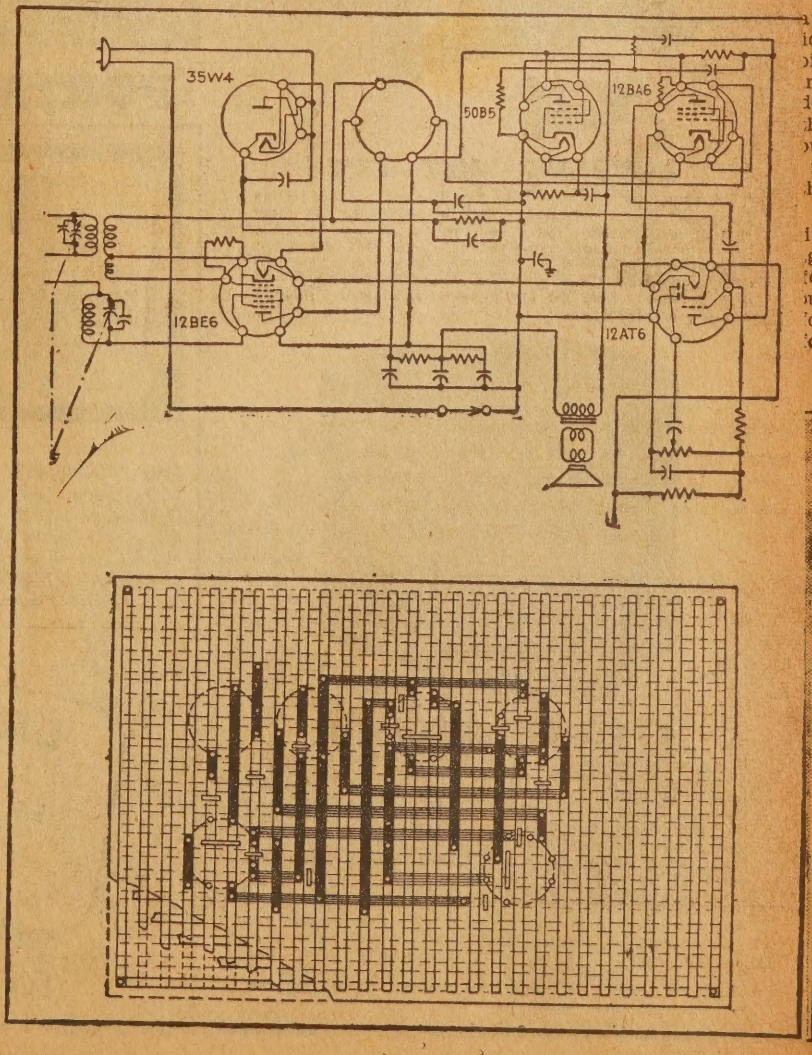
The deck next goes to a punch press, where all holes for eyelets and pins are knocked out in a single operation. The holes in this particular case are 96/1000-inch in diameter and take pins similar to those used in the manufacture of octal tube bases. In still another press, eyelets and pins flow from hoppers through feeder tubes to deck holes, as in the manufacture of tube sockets, and are clinched in place. Heating by conduction, or induction, may be used to sweat conductor and eyelet and/or pin tinning together.

The stamped wiring deck is now complete, and ready to receive co ponent parts. See Fig. 2.

Wire leads of fixed capacitors, res tors, and coils are bent or preform so that they may be dropped into e let or pin holes in the stamped w ing. This may be done manually or the hopper method, depending up the ingenuity of the assembler a production requirements. Norma most component parts are placed beneath the deck. Thus these parts m be soldered in place by the inducti method, in one operation.

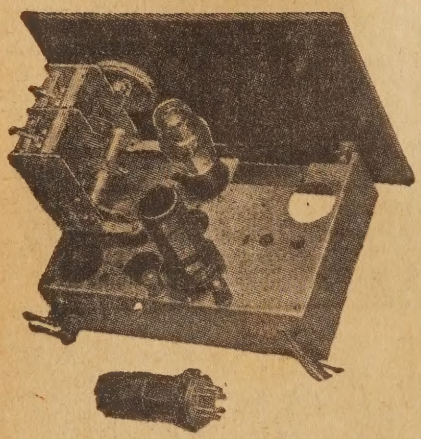
Tube and i-f transformer sock having female connectors are insert on the top side of the deck over pi or otherwise fastened in place, as Fig. 3. The deck is then installed beneath a metal chassis having cutou through which tubes and i-f tran formers may be inserted from abo See Fig. 4. A self-tapping screw each corner of the deck holds the de securely in place beneath the chass

Gang tuning capacitor, loudspeak and controls are mounted on the met chassis by conventional methods. Fle



Electronic circuits, showing the manner in which a schematic may be converted into a stamped wiring deck layout by interconnecting and/or cutting conductors on obverse and reverse sides of the deck. Tube and transformer placement are indicated. Other component parts may be similarly shown.

THREE FINE KIT-SETS



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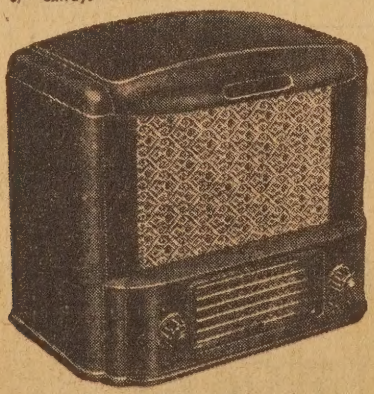

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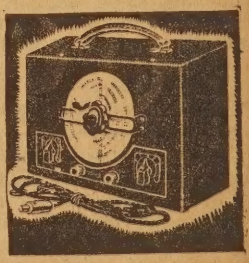

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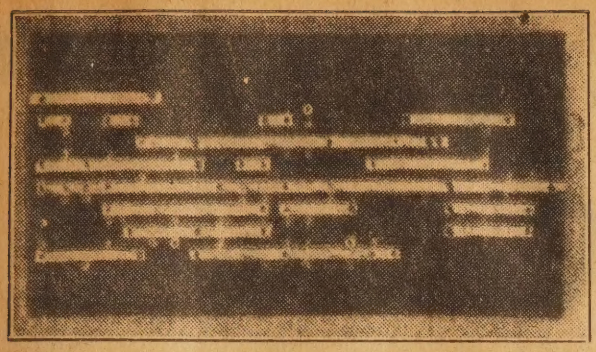
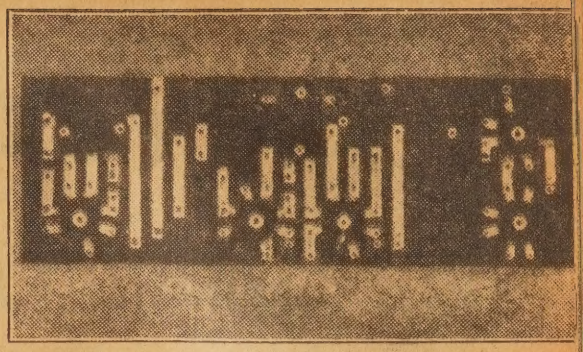


One side of a stamped wiring deck, with conductors cut, eyelets and pins installed. Either type of connection may be used between conductors on the two sides of the deck. Holepin eyelets and pins are used as terminals for component parts.



Valve and transformer sockets in place. In this instance they are held by eyelets. In other developmental models, the use of female connectors permits them to be simply pushed down over deck pins.

ible leads from these component parts, of which there are few, are pushed through chassis cutouts to deck pins, where contact is made by means of female connectors. They could, of course, be soldered.

PERFORMANCE TESTS

Performance tests are being made on equipment using stamped wiring. At this writing it appears that little or no circuit modification is required where it is to be employed. Developmental radio receivers, such as the one shown in Fig. 5, perform quite as well as conventionally-wired sets with respect to sensitivity and selectivity. There is reason to believe that the fixed nature of the wiring, plus the fact that necessarily careful planning of both the wiring and placement of parts, may make it possible to operate tubes nearer the spill-over or hot point in production models, with resultant improved performance.

Alignment of circuits in production should be materially simpler than where conventional wiring is used, since wiring stamped out by a die will not vary from set to set. This factor should prove of particular interest to manufacturers of television equipment.

COST DETERMINATION

Cost determination must wait until a sufficient number of units employing stamped wiring are manufactured to permit accurate cost accounting, since material, and alignment and test labor, as well as assembly labor, is involved. Then, too, die cost will vary depending upon the size of the deck required, upon the relative complication of the wiring to be stamped, and upon the volume achieved by supplier and assembler.

Substantial savings should be possible. One clue is the fact that Franklin believes it will be possible to supply stamped wiring decks for 5-tube table model radios, with tube sockets built in and ready to receive component parts, for about double present cost of sockets.

The imaginative will soon visualise many other ways of using the new construction than those outlined here. For instance, it is not difficult to visualise how it will simplify the construction of very small sets, by saving space not only in wiring, but in the construction of coils and resistors, and even condensers.

SMALL SETS

There is no reason why tuning coils should not be stamped or sprayed directly to the "chassis," using the helix shape similar to that found in the "catherine wheel" used on Guy Fawkes day. Such coils would occupy very little space, and should be quite efficient.

Where resistors are required, the "ink" used in construction could be made in such a way as to possess the right amount of resistance required for a grid leak or a plate resistor.

Similarly, the smaller values of condensers could be made by separating portion of two wiring leads with the necessary insulation, which could also be sprayed on. Several layers of insulation and conductor would all various capacities to be realised, if single layer was not sufficient. O can visualise a receiver almost cor pletely built up on a flat plate.

In the construction of small tran mitters, such as might one day used for citizens' radio sets, the id has many uses. Some of the UH transmitters are capable of being bu using very simple circuits, so simp in fact that the whole thing can built round the actual valve, itse a miniature type.

Two types of such transmitters ha in fact been used in USA, one whic had the necessary wiring and coi painted on the valve envelope, ar another which used a steatite cylind for this purpose, slipped over th valve. They have been used on abo 140 mc. both in demonstrations, and f actual relayed broadcasts over th ordinary broadcast networks.

The overall size of such transmi ters is about the same as the averag lipstick case, except, of course, fo batteries. In this connection, abou 120 volts at three mills. is used fo plate supply, and a baby torch cell fo the filament.

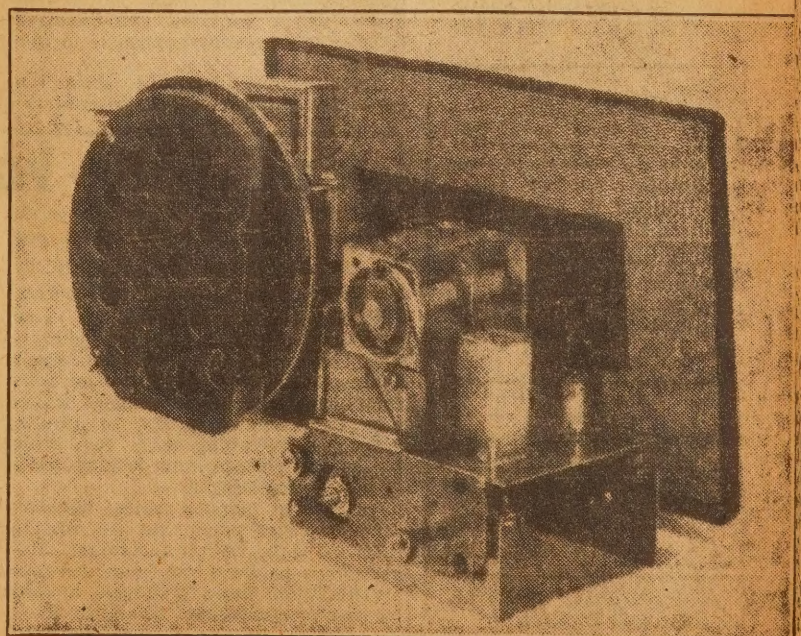
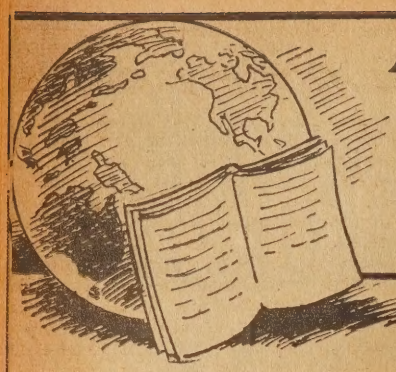


Table-type radio set, using stamped wiring. One edge of the wiring deck may be seen just beneath the metal chassis.



Technical Review

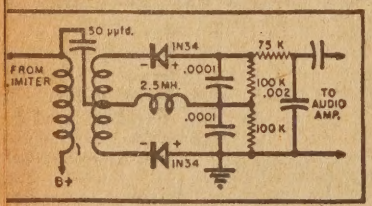
GERMANIUM XTALS FOR F.M. DISCRIMINATOR

In a recent issue of "Radio News," N. L. Chalfin describes the use of type 1N34 crystal diodes in an F.M. discriminator unit. Wired into the circuit in the same manner as a couple of resistors, the crystal diodes are said to out-perform the 6H6 they replace.

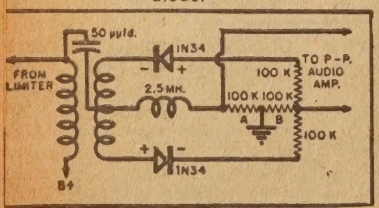
THE number of valves required is an immediate disadvantage of FM receivers, and any development likely to reduce the cost and complexity of the necessary circuits is thus of interest. The application of crystal diodes to the discriminator stage appears to be a logical step.

The assembly pictured here is the essential part of the discriminator circuit, and the crystal diodes are on either side of the RF choke. They are soldered permanently into position in the same way as other wiring components. They have indefinite life and require no adjustment.

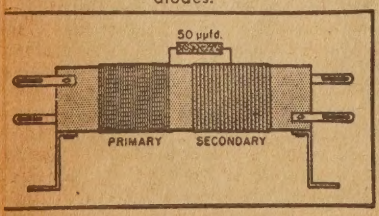
The advantages claimed by the author include reduced cost and complexity,



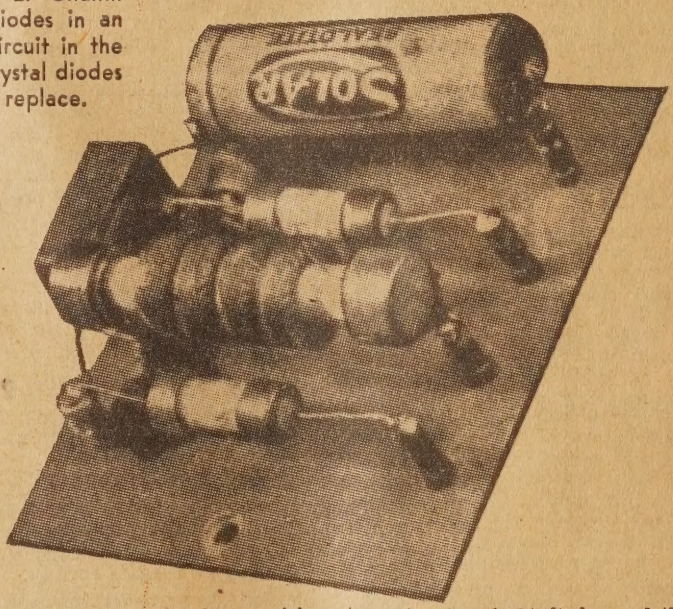
The conventional Foster-Seeley discriminator circuit utilising the 1N34 crystal diode.



The Summerhays discriminator circuit which provides increased output for either a push-pull or a single ended amplifier. Note the polarity of the diodes.



The physical arrangement of the I.F. transformer used for the tests.



freedom from hum troubles arising from heater circuits, and increased output in comparison with the 6H6 vacuum diode.

The Sylvania Company is now manufacturing the 1N35 germanium diode, which contains twin-matched rectifier units readily applicable to this circuit.

Accompanying diagrams show the conventional Foster-Seeley discriminator using two 1N34 diodes and the less familiar Summerhays circuit. This latter arrangement is said to give higher output than the Foster-Seeley circuit, the signal being suitable for direct application, where required, to a push-pull amplifier channel. It will also operate a d-c meter without amplification to indicate centre frequency tuning.—From "Radio News," March, 1947.

MAIL YOUR VOICE ON PAPER

MAGNETIC disc records on paper no thicker than ordinary typewriter bond were demonstrated recently by the Brush Developing Co., of America.

Known as Mail-A-Voice, the new equipment is designed chiefly for business correspondence between firms equipped for it, but has a host of non-communications uses, among which may be included study of foreign languages, recording one's own voice for speech culture, and logging parts of radio transmissions.

The record may be mailed like any other piece of paper, but the folding must be done before recording. Records may be erased and recorded several thousand times, if desired, or may be filed for permanent reference. Each of the records plays for three minutes. Cost is only a few pence each.

Fidelity of the machine is suitable for speech only. A single crystal unit acts both as microphone and receiver. Three tubes are used in the amplifier. Recording is at 40 lines per inch, inside-out, and the recorder operates at 20 revolutions per minute.

Spectators at the demonstration wondered what means were used to keep each line of recording within its own "groove." The answer is simple. No means are used. The magnetic field spreads to both sides of the recording line, but falls off in strength on each side so rapidly that with ordinary amplification "adjacent-channel interference" is inaudible.—From "Radiocraft," March, 1947.

FULL FREQUENCY RANGE RECORDING SYSTEM

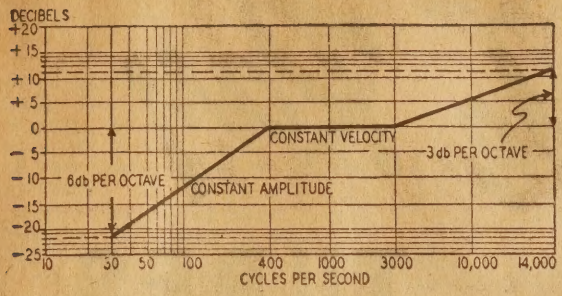


Figure 4. The recording characteristic for FFRR recordings.

For some months now FFRR—full frequency range recording—has been in the news, with its promise of vastly improved quality from lateral discs. Here is the story of the new Decca technique, as told by Major Ralph Hallows, European correspondent for "Radio Craft."

FFRR stands for *full frequency range recording*. More important still, it stands for *full range frequency reproduction*; for it is one thing to cut on a wax disc spiral grooves which record the whole range of audible frequencies and quite another, as we shall see, to find a way of making a phonograph reproduce everything that is put on to the wax.

I admit freely that when I first heard of FFRR I was not greatly excited. I am much too old a bird of the radio and phonograph worlds to flutter blindly into decoys baited with sales talk about "The Very Soul of Music," "Reproduction That Is Real," "Every Sound in the Studio Brought to Your Home" and that kind of thing.

REPRODUCTION LIMITS

On investigation the perfect reproduction promised is too often found to depend upon a.f. amplifiers with a complete cut-off at or below 5000 cycles, a false bass produced by cabinet and other resonances, and harmonic distortion ranging from 10 to 15 per cent. more.

I am the first technical writer to have the opportunity of investigating the British Decca system. I approached the investigation in a distinctly sceptical frame of mind, but before it was ended I was convinced that they had tackled the problems of the phonograph in an entirely new way and that they have achieved improvements so outstanding that they may almost be classed as revolutionary.

MAIN DEFECTS

The main defects of the phonograph as we now know it may be summarised as follows:

1. Surface noise, or needle scratch spoils the beauty of music by its annoying background.
2. Even the best of ordinary records deal very poorly with the upper audio frequencies.
3. Transients, such as the sounds of tympani, *pizzicato* on strings, or the clean-cut notes of the cornet are not realistically reproduced.
4. Transients, in fact, are often reproduced as very unpleasant sounds, jarring on the ear.
5. Sound contrasts are unduly compressed: the phonograph is very far from bringing out the real contrasts between *fff* and *ppp* that actually occur in the course of an orchestral performance.
6. The reproduction distorts, sometimes very unpleasantly, the sounds of music.

Believe it or not, most of the six defects enumerated have one and the same origin: the surface noise. It has long been realised that surface noise was one of the greatest enemies of the phonograph; but not until these recent researches were made was the extent of its evil influence fully grasped.

Surface noise consists of impulses giving rise to purely random wave forms, which cannot be analysed in any combination of sine waves. It is in fact, the sound-wave counterpart of static and its effects on a pickup are similar to those of static on an aerial.

Static shock-excites an antenna causing it to oscillate at its natural frequency. Surface noise shock-excites a pickup making it produce a strong response at any frequency at which it has resonance.

The response curves of most pickups show marked resonance peaks well within the audio frequency range and usually towards the upper limit of the compass. For that reason they reproduce surface noise as a high-pitched hissing sound.

Besides its unpleasantness, this hiss is sufficiently strong to drown the upper audio frequencies when the recording level of sound is low. Hence it has been necessary when making recordings to monitor severely, keeping the sound level of the music always *above* that of the noise; in other words, contrast compression must take place in the recordings.

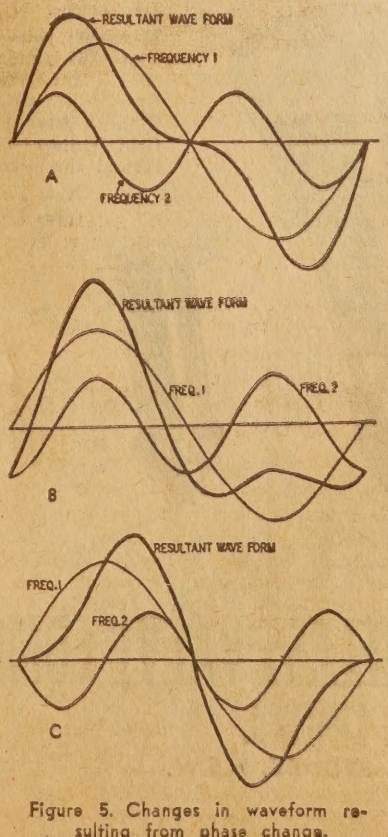


Figure 5. Changes in waveform resulting from phase change.

HIGH LIMITS

Until comparatively recently no record contained any worth-while amount of frequencies above 5000 cycles and few radio phonographs were able to bring out audio frequencies even as high as that. The reason is simply that a better response at the upper end of the scale would have meant giving greater prominence to surface noise hiss.

In theory the proper reproduction of transients can be obtained only if all the harmonics right up to infinity are present. In practice perfectly acceptable reproduction is had if the harmonics within the audible range—say up to 15,000 cycles—are brought out. But transients sound unreal and lose their characteristic crispness if there is a cut-off much below 15,000 cycles.

TONE CONTROLS

With its 5000-cycle cut-off the radio phonograph cannot do them justice. And matters are often made far worse by the listeners' use of the tone control. In self-defence against the hiss the listener often turns the knob as far as it will go, producing in some cases a cut-off as low as 3500 cycles.

You will see now how strongly surface noise militates against good reproduction. Many attempts have been made to reduce it by the use of special needles, of filter circuits and of materials for the record blanks.

Some needles are a little better than others, but none effects a cure. Filters are almost useless, since surface noise is random, occurring not on one frequency or narrow band of frequencies but on all frequencies from about 1500 cycles upward. Discs of soft plastic material, such as the vinyl compounds, may lessen the noise a little, but they also cut down the high-frequency response of the pickup.

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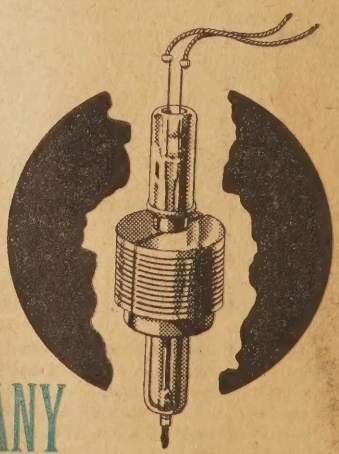

AMALGAMATED WIRELESS VALVE COMPANY PTY. LIMITED.

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The reason? Well, it is just that with these softer materials what is known as "cold flow" is apt to take place. The material has not sufficient rigidity to force the needle point to follow the grooves. Instead, the needle deforms—bends—the grooves as it traverses them and they spring back into their original shape after it has passed. The microscope will show that the upper audio frequencies are on such a record, but when it is played cold flow prevents them from being reproduced.

Decca's first line of attack was to produce a pickup with no resonance within the audio range. Figs. 1, 2 and 3 illustrate its make-up. The body of the pickup is 1⅜ inch in length, 1⅛ inch in diameter and ⅜ inch in depth. When balanced on the tone arm its weight is six-tenths of an ounce.

MOVING IRON

As will be seen, it is of the moving iron type and contains many interesting features. The rubber mount of the armature allows free lateral movement but enforces complete rigidity fore and aft. The magnets are so situated that when a record is being played they are little more than one-sixteenth of an inch above its surface. The maximum flux change through the armature is thus obtained. The pivot of the armature, being near the top of the pickup, is well away from the area of flux change.

The playing tip of the armature is of sapphire; after 1000 records the pickup is opened by undoing the milled screw, the armature and its mount are removed and thrown away and replaced with a new armature complete with mount.

This pickup has no resonances below 14,000 cycles and surface noise is very slight when it is in use. Shellac is used for the record blanks, the particles of the filler being ground very fine and passed through a sieve with a mesh of 300 to the inch; they are thus too small to give rise to waves of audible frequency.

RECORDING HEAD

The recording head is of the moving coil type with very low mechanical inertia. The range of frequencies actually cut on the master record is from 30 to 14,000 cycles. *No monitoring or contrast compression* whatever takes place during recording. The gain control is set before recording begins to prevent an overload occurring on the loudest passages. It is not touched again.

When a very soft passage occurs, the level of the music is actually allowed to fall, if need be, below the noise level. This may sound surprising, but it is amply justified by the results. One is so entranced by hearing the music played as the conductor's baton directs, that the hiss is noticeable only on passages which are exceptionally pianissimo and is never annoying.

The recording characteristic is shown in Fig. 4. It will be seen that from 400 to 30 cycles at constant amplitude, there is a drop of 6db. per

DETAILS OF PICK-UP ASSEMBLY

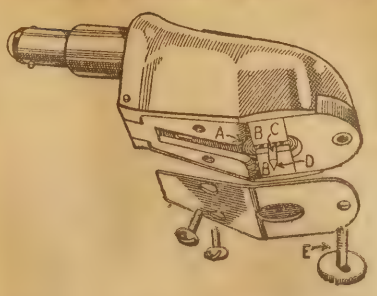


Figure 3. A—coil; B—magnets; C—armature; D—sapphire; E—milled screw.

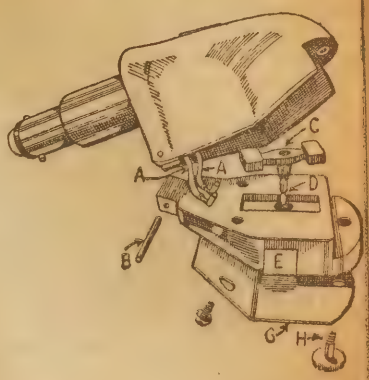


Figure 2. Pickup exploded. A—leads from the coil; B—hinge pin; C—rubber mount for armature; D—the armament; D—the armature; E—magnet; G—cover plate.

octave. After the changeover at 400 cycles the characteristic (constant velocity) is level to 3000 cycles.

From that point upwards, the rise is 3db. per octave. This rise is deliberately made to begin at 3000 cycles, because it is realised that the records will often be played on ordinary radio phonographs, almost all of which have loud-speakers peaking at or about this point, and then showing a falling characteristic.

It is found in practice that a rise of 3db. per octave is the most that can be used profitably. If the rise is steeper, the pickup needle is liable not to track properly at high frequencies, owing to the sharpness of the curves of the grooves.

Though these records can be used with very good results on ordinary radio phonographs, only a specially designed reproducing instrument can bring out their full beauty. Radio and phonograph designers are usually well

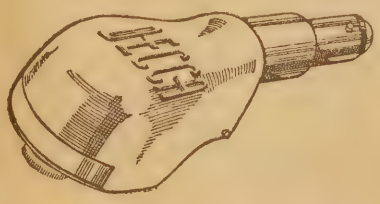
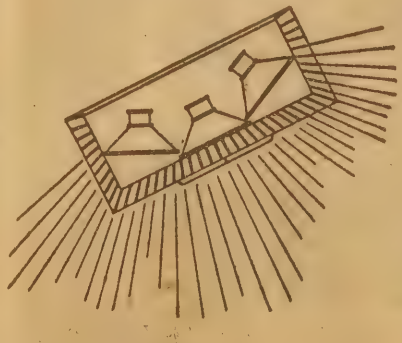


Figure 1. The new Decca pickup is 1⅜ x 1⅛ x ⅜ inches.



Three loudspeakers in the Deccola ensure even distribution of sound, particularly at the higher frequencies.

satisfied if the harmonic distortion the reproduction does not exceed 5 p cent.

This undoubtedly fills most requir ments, as long as the AF response do not extend much beyond 5000 cycl But when an amplifier is capable of response of up to 14,000 cycles, such percentage of harmonic distorti would cause unpleasant effects owi to the production of parasitic diffe ence and summation frequenci whose number increases as the fr quency range is widened.

Many text books state that pha distortion is of small account in radi and phonographs. This may be tr enough where the cut-off is in t region of 4500 to 5000 cycles; but does not hold good for wide frequen range amplifiers.

Figure 5, by illustrating a ve simple example, will serve to sho what effects phase distortion ma have.

PHASE DISTORTION

Suppose that a sound made in th studio consists of two frequencies, wit the phase relationship seen at A; the phase of the higher frequency shifted 90 degrees, as at B, durin recording or reproduction, the re sultant waveform has a totally differ ent shape. The shape is again entirel altered if the phase-shift is 180 de grees, as seen at C. B and C repre sent very simple forms of phase dis tortion.

Phase distortion is then of grea importance in an amplifier with range of 30-14,000 cycles, and step have been taken to reduce it to negli gible proportions.

The Deccola, as the Decca Com pany's own reproducer is called, con tains four stages of triode Class-A am plification. Careful design has re duced the harmonic contest to 0.5 pe cent. Three 12-inch loudspeakers ar used, arranged on the convex arc of circle, so that the sound is evenl distributed, and there is no beamin of the high frequencies. One can wal about the room without finding th high notes stronger in some places than in others.

The Deccola is an electric grame phone only, the present models having no radio equipment. Despite the high price, over 2000 of the instrument have been sold at time of writing

WHEN THE EARTH STIRS IN SLEEP

Fissures opened in a road in New Zealand after an earthquake a few years ago.

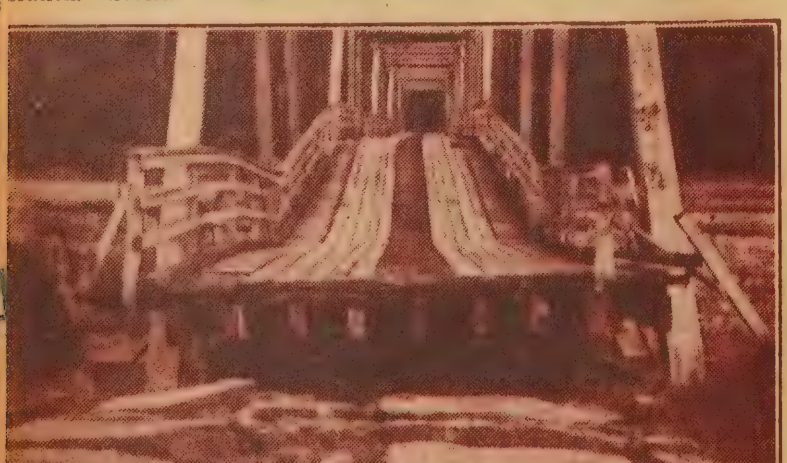
Of the forces of nature most feared by man the earthquake takes first place. No other phenomenon causes such destruction and loss of life in so short a space of time. The occurrence of earthquakes is so unpredictable as to make life in many of the earthquake zones particularly hazardous.

EARTHQUAKES have been "in the news" recently, and hardly a day passes without a report appearing of earthquake disturbance in some part of the world.

At first sight, earthquakes seem more prevalent of late. I have been assured however, by those who should know, that the number of earthquakes about is no more than normal.

The earth is in a constant state of vibration. Several hundred earthquake shocks are felt every day. Fortunately most of these are so slight as to have no appreciable effect on our daily lives. True, there have been some very large shocks registered lately, but these have been confined to the earth under the sea, and have not caused damage or loss of life.

That most earthquakes occur under the sea is understandable when it is considered that most of the surface of the earth is covered by water.



This New Zealand bridge was literally torn in two—during the same earthquake.

Earthquakes occur in clearly defined zones on the earth's surface. Japan is located in one of these zones, which runs from that point right through the South West Pacific, taking in countries as far south as Java and New Guinea, then across the Pacific to the west coast of America, and down to South America. Included in this zone is New Zealand, and the islands associated with the South Pacific Ocean. Fortunately Australia misses inclusion in the zone by a narrow margin, although we have felt certain shocks which have been no more than earth tremors.

Another zone crosses southern Asia and Europe taking in Italy and Portugal and the other countries along the Mediterranean.

There appears to be no settled ideas as to the cause of earthquakes. The collapse of a huge underground cavity could be as destructive as the slipping of the earth on one side of a crack in the earth's crust. Subterranean volcanic explosions could be another source of earthquakes, although modern opinion leans to the belief that the eruption of volcanoes which often accompany earthquakes is caused by the earthquake rather than vice-versa.

As it is not possible to see the actual event taking place beneath the earth, and as the 'quake usually occurs suddenly, the study of earthquake phenomena is necessarily spread over a large period of time, and progresses only with the improvements in instruments and mathematical research.

It would appear that most earthquakes are caused by "faulting." This opinion is almost universally accepted, although it is known that many earthquakes occur in regions where no "faults" are known to exist.

A "fault" is really a large crack in the surface of the earth. The outer surface of the earth consists of a heterogeneous mixture of earth and rock formations down to a depth of approximately 25 miles. These rock formations sometimes break down to considerable depths, and the opposing sides of the fracture slide up on one another. This slipping movement is known as a "fault."

A great amount of work has been done in the study of the outer layer or crust of the earth. It has been found that the layering of the crust in the Pacific region is different from that in other regions. This fact is very significant in view of the prevalence of earthquaks in this region.

It is known that most earthquakes have their centre within about 12 miles of the earth's surface. The greatest depth of origin do not exceed about 400 miles, and this only in special regions, mainly in the Pacific area. The amount of energy released in these deep earthquakes is very great. All this information has been deduced through the study of the waves pro-

DEATH AND DEVASTATION FOLLOW

by Calvin Walters

duced in the earth by the earthquake shock, and of which more anon.

Below the upper 25 miles of crust, the earth appears to consist of three main divisions: (1) From about 25 miles to 450 miles a region of possibly ultra-basic rock (rock in a more advanced state than elementary rock); (2) between 450 miles and 650 miles (probably a transition region although this is not universally agreed upon); (3) between 650 miles and 1800 miles, a dense modification of ultra basic rock brought about by high pressures.

It has recently been discovered that the central core of the earth is a composite mixture of materials between 1800 and 3000 miles, while from there to the centre (approximately 4000 miles down) there is a constant "inner core" which occupies about 1 per cent. of the total volume of the earth.

Recent investigations on the speed of earthquake waves through the earth (and all information given here is deduced from such data) it appears that most of the central core of the earth is in a fluid state. However, with regard to the INNER core it has been suggested that, owing to the extremely high pressures involved, the inner core is solid, and may consist of magnetic iron material which could have some bearing on the subject of the permanent magnetism of the earth.

It is little wonder then that, the earth being such a mixture of various strata, is subject to strains and stresses which manifest themselves in earthquakes.

The study of earthquake phenomena is carried on through the science of seismology, a word derived from seismos, meaning "an earthquake" and logos, meaning "a discourse."

Modern seismology dates from about the end of the 19th century. Previous to this, earthquake phenomena was studied mainly from observation, but in 1892 John Milne and a number of other scientists, including Ewing and Grey, working more or less together in the study of Japanese earthquakes, developed the instrument known as the seismograph, for the recording of earthquake shocks.

Prior to this, crude instruments were used for observing the direction of the largest shocks. There was an idea of Babbage using a bowl of treacle, in which the liquid by its viscosity remained steady while the bowl moved with the earth tremor. The treacle left a "high-water" mark as evidence of the movement. Other instruments made use of mercury in glass tubes, as the steady body, but all of these could do no more than move with the heaviest shocks, and did not record the actual pulsations. Furthermore, the observer must be on hand at the time of the shock.

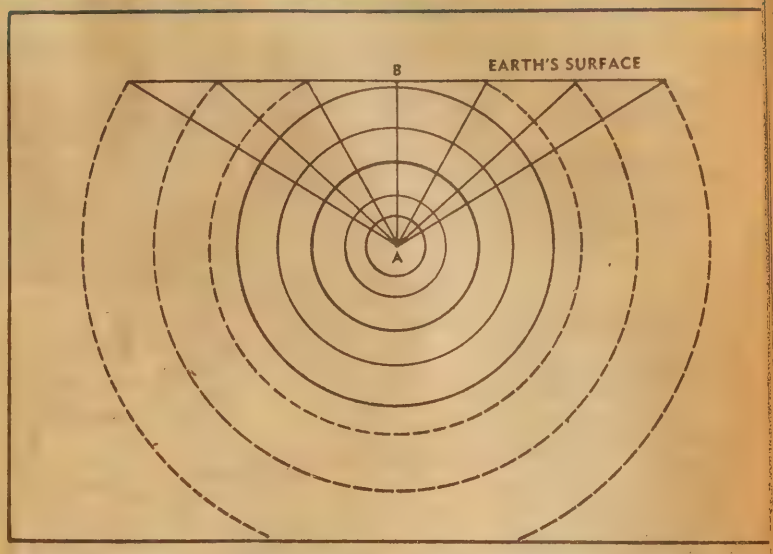


Diagram showing how earthquake shock waves travel out from the centre of th disturbance.

The instrument invented by Milne actually recorded the entire earthquake motion in time so that the amounts and rates of motion in every direction could be estimated from the record. This is the principle used at the present time, although there have been advances in construction.

The simplest explanation of a seismograph is perhaps that of a heavy plumb bob suspended by a long cord

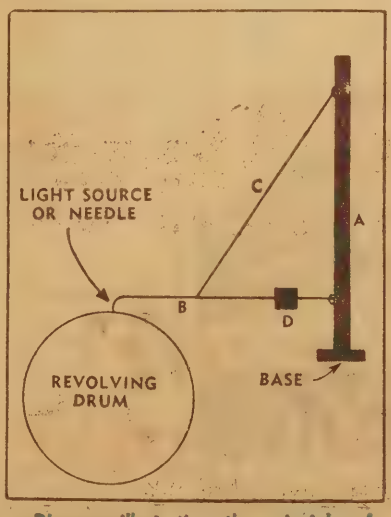


Diagram illustrating the principle of the seismograph.

from a support. The end of the b is furnished with a pencil which re lightly on a piece of paper on t ground. When an earthquake occu the ground moves together with t support, but the bob, owing to heavy weight, remains stationa Thus the paper moves beneath t pencil, producing a tracing of t earth wave on the paper. Later tracin will be a combination of the ear wave and the movement of the b which inevitably begins to swing owi to the motion.

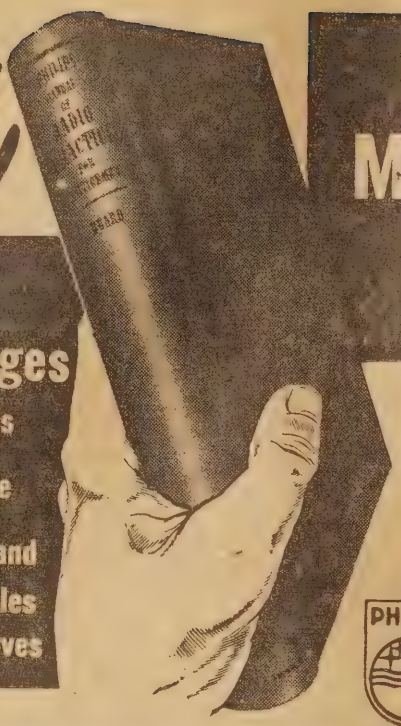
In the Milne instrument, the pe dulum or bob is replaced with "boom" supported on an upright mer ber as in the illustration. (a) Is upright about 15 inches high; (b) a metal rod, probably 6 feet lo hinged to the base of (a) and su ported by an unspun thread; (c) counterweight (d) keeps the boo steady and the end of the boom furnished with a recording needle light source.

This needle is in contact with smoked strip which is attached to drum revolving in a given period. the modern instrument, the drum furnished with sensitised photograph paper. The light source on the en of the boom traces the wave patte on the paper which is developed afte wards in the usual way.

Let us now see what happens whe an earthquake occurs in some part the world.

The 'quake sets up waves within th earth (these waves will be discusse later) which reach the station whe the seismograph is situated. The wav carries with it the support (a) an the revolving drum. The boom (b remains steady during the first shoc by means of the inertia of the weigh

JUST OFF THE PRESS!



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ROAD GAPES WHEN EARTH QUAKES

This picture shows how the earth is rent apart under the great stress of earth movement.

(d). The needle thus traces on the smoked strip, or the light traces on the paper, the pattern of the wave. This is known as a seismogram. A reproduction of a typical record is given here.

The smoked strip record is visible during the passage of the wave while the photographic record is not available until after it has been developed. It is this record which enables the observer to determine the location of the earthquake, its intensity and the time it occurred.

READING THE RECORD

Having now described the instrument, we will now detail the method used to decipher the record.

Whatever the cause of earthquakes, it is known that it arises from a sudden release of force stored up within a fairly narrow and confined region below the surface of the earth. The centre of the disturbance is called the "focus" and the point on the earth's surface immediately above the "focus" is called the "epicentre."

A study of the diagram given herewith will help to make the matter quite clear. In the diagram A is the focus and B the epicentre of the disturbance.

The original disturbance sets up a train of waves which travel outwards in all directions. If the substance of the earth was uniform in consistency, the waves would travel outwards in successive spherical shells as shown. But as the earth is not uniform, it follows that the waves will have to pass through substances of varying density, so that they will be retarded, reflected and refracted in varying degrees. However, for our purpose it is sufficient to consider the waves as being transmitted uniformly.

VERTICAL SHOCK

At the moment of the first shock, the epicentre (A) will suffer a vertical shock or an up and down movement. This can be very severe.

As the distance increases from the epicentre it will be seen from the diagram that the wave comes up obliquely from below and thus assumes at various points an undulatory movement.

In the mathematics of seismology the earth is treated as an elastic body. It has been proved that two kinds of waves can pass through such a body, and in the science of seismology these are called P waves or primary or "push waves." Then there are the "S" waves also known as secondary or "shake" waves.

The "P" waves are dilational like sound waves and are also called "longitudinal" waves. They move back and forth in the direction of progress.

"S" WAVES

The "S" waves are rotational like light waves. Also known as "transverse" waves they move at right angles to the direction of progress.

Both waves travel at different speeds. "P" waves have an average velocity near the surface of 4 to 5 miles per second, whilst "S" waves have an average velocity near the surface of 2 miles or so.

These two waves are two of the main features of a seismogram and tell not only about the 'quake but also reveals facts about the interior of the earth as given earlier.

A seismogram consists of series groups of waves, each group d away before the next group be The group is therefore a phase of disturbance. It is interesting to that the seismogram is marked o minutes.

The record of a seismogram is r in three parts. The first part series of waves of little amplit This is the preliminary portion. two is the principal portion, and s a wave of considerable amplitude. three is known as the coda or end

The waveform of a seismogram combination of the two types of w and the expert has no difficulty separating them, for the "P" w travel faster than the "S" waves are therefore clearly marked to expert.

TIME DISTANCE

The time distance of the two w is directly related to the distance the earthquake from the point of servation. It has been likened to trains leaving a station at the s time, travelling along the same r at a constant but different speed the time that each train passe given station is known, then the tance between stations and the t of start can be easily computed."

Tables are used, together with seismogram, to compute distances origin. After the first shock is reco the boom of a seimograph begins move slightly just as any other p dulum, and, of course, the wa form of the seismogram contains a record of this movement. T however, is easily deciphered by expert.

As mentioned earlier, the earth always in a slight state of tremor, these tremors are often recorded. E local disturbances caused by ex sions show on the record, but waveform is quite different from earthquake wave.

OTHER TREMORS

The tremors other than earthqua are called "microseisms" while ear quake tremors are called "macr isms."

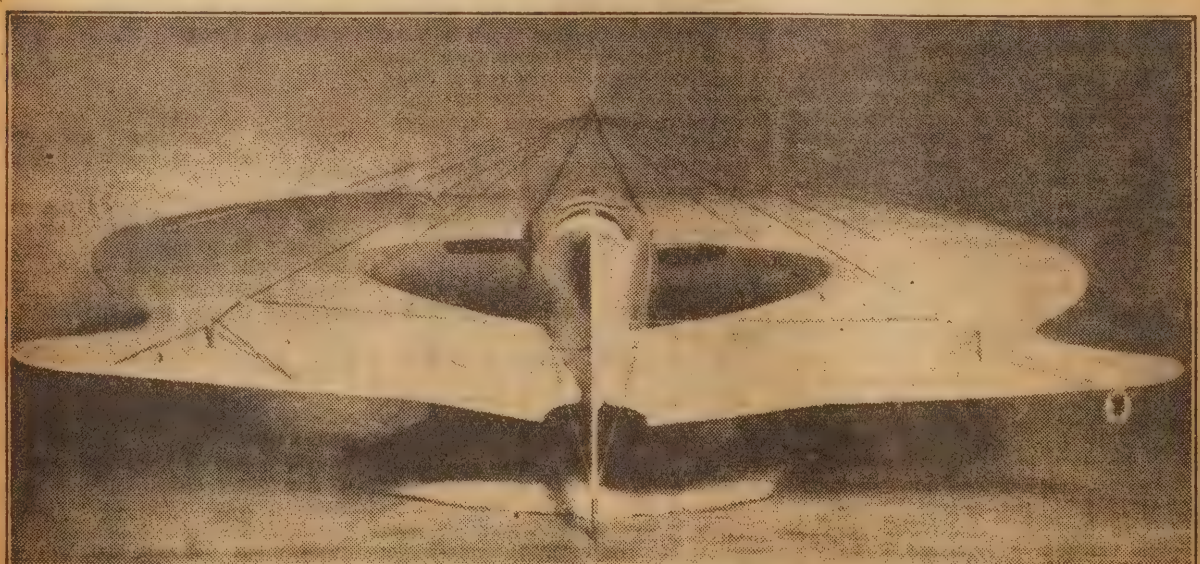
In order to fully record the ear quake, at least two seismographs necessary at a receiving station, more usually three are installed. records the vertical shocks, one east-west waves, and the third north-south waves. When two only used, one instrument records types of waves.

Our Sydney Observatory is equip only for receiving the east-west wa This is no reflection on the authorit for this station is essentially an ast nomical observatory. Seismology is science distinct from astronomy a is usually left to the specialist.

The main seismological station New South Wales is at the Riverv College Observatory on the Lane C River near Sydney.

PARABOLIC AERIAL HEARS SKY SIGNALS

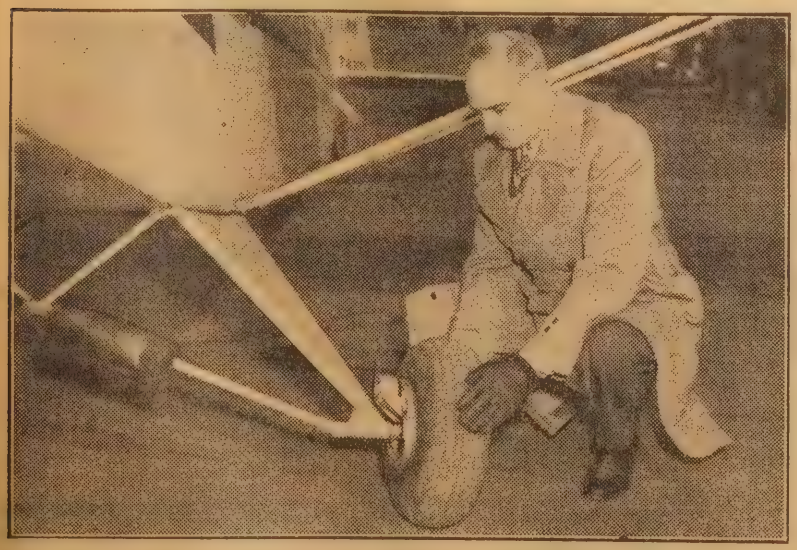
To receive electro-magnetic radio energy from the cosmic space, American Grote Reber built this strange antennae in the back yard of his home. The huge disc or mirror is mounted on a rack, and faces the southerly sky. It can be tilted at any angle of declination along the north-south meridian. One of the circular tracks is calibrated in degrees so that he can focus the mirror in the direction of the cosmic static he wishes to intercept. The radio waves captured by the mirror are directed to the mouth of a drum containing a radio amplifier. This converted electro-magnetic energy is heard as it swishes over his super-sensitive radio. Reber began his astro-physical experiments 10 years ago.



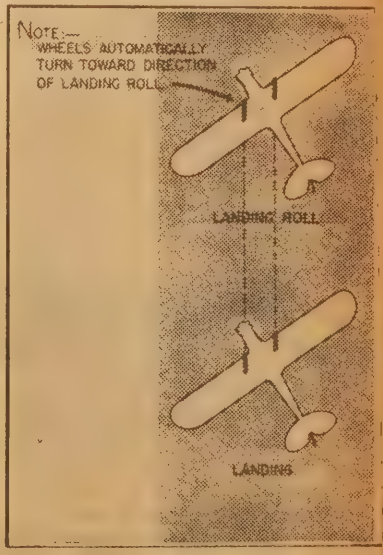
A real Flying Saucer—Britain can own a Flying Saucer which cost £17,000 to build, flew 11,000 miles in tests at Shoreham-by-sea, Sussex. The designer of this annular monoplane, G. Tilghman Richads, does not know whether anyone has been secretly experimenting with his design, but expresses the opinion that, jet powered, it should reach a speed of 1,000 miles per hour.

NEW LANDING GEAR FOR LIGHT PLANES

This one-point landing being made by Test Pilot Art Chapman would normally be a set-up for an accident in a ground loop, but the cross-wind landing wheel, turned to the left here, keeps the craft on a straight glide to the landing strip. It is claimed that the new landing gear makes possible the location of single direction landing strips for small planes within city limits.

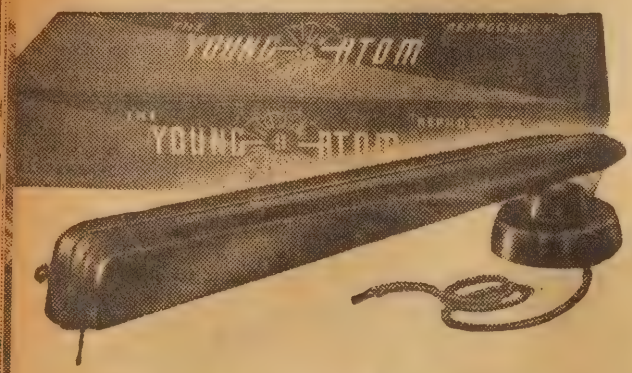


Test Pilot Art Chapman demonstrates how the wheel is able to turn in a 50 degree arc, 25 to the right and 25 to the left. The wheels automatically turn the plane on a straight course when they come in contact with the ground.



Illustrations show the difference in forces exerted on an airplane with normal gear and the cross-wind landing gear (castered type). Tendency for plane to ground loop is eliminated by the cross-wind gear according to recent tests.

O.K. FOR SOUND ENGINEERS AND HOBBYISTS



The Young-Atom gives you everything that could be desired in a Magnetic Pick-up. The Bakelite moulded arm is attractively designed and reduces Resonance Peaks to a Minimum. Attractively priced at 57/-.

YOUNG ATOM FEATURES

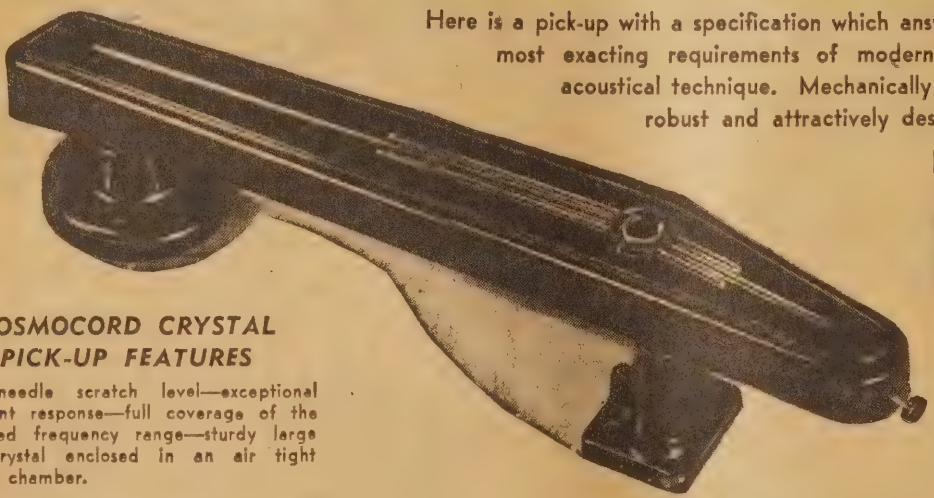
Needle pressure of 1½ ozs. Correct tracking over frequency range—response within 3.D.B. -I- or — over Normal frequency range.

COSMOCORD CRYSTAL PICK-UP

Here is a pick-up with a specification which answers the most exacting requirements of modern electro-acoustical technique. Mechanically it is very robust and attractively designed.

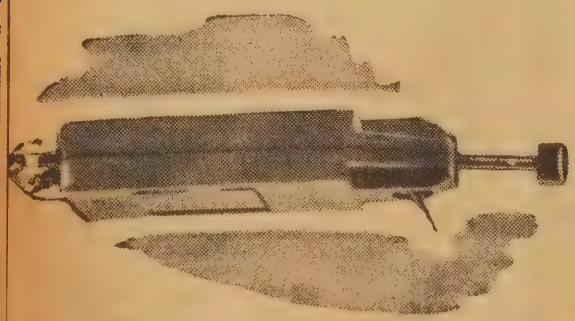
PRICE

67/11



COSMOCORD CRYSTAL PICK-UP FEATURES

Low needle scratch level—exceptional transient response—full coverage of the recorded frequency range—sturdy large size crystal enclosed in an air tight sealed chamber.



COSMOCORD CRYSTAL CARTRIDGE—31/-

Now back on the market to give you hours of listening pleasure. Reproduction of lifelike clarity ENSURES no surface or needle noise with Cosmocord Crystal Pick-up Cartridge. The home set builder will find the COSMOCORD CRYSTAL PICK-UP CARTRIDGE a fitting finish to reward him for hours of work.

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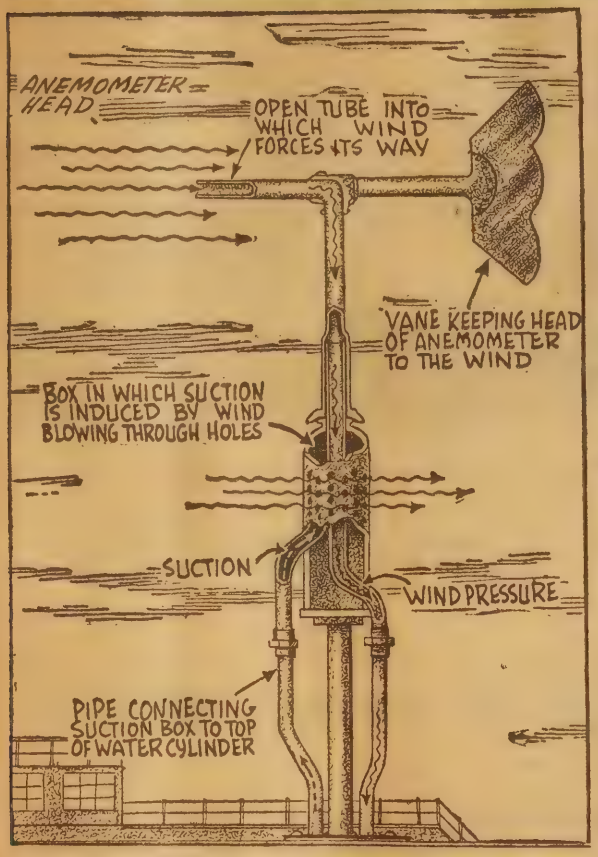
THE ANEMOMETER RECORDS WIND SPEED


ANEMOMETER HEAD
OPEN TUBE INTO WHICH WIND FORCES ITS WAY
VANE KEEPING HEAD OF ANEMOMETER TO THE WIND
BOX IN WHICH SUCTION IS INDUCED BY WIND BLOWING THROUGH HOLES
SUCTION
WIND PRESSURE
PIPE CONNECTING SUCTION BOX TO TOP OF WATER CYLINDER

The top of the instrument accepts variations of wind pressure and feeds them down a tube.

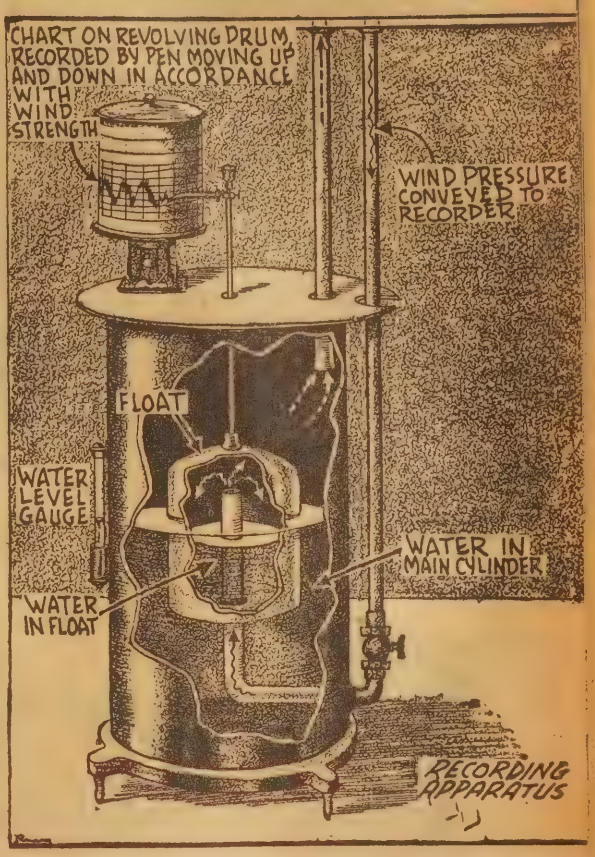


CHART ON REVOLVING DRUM, RECORDED BY PEN MOVING UP AND DOWN IN ACCORDANCE WITH WIND STRENGTH
WIND PRESSURE CONVEYED TO RECORDER
FLOAT
WATER LEVEL GAUGE
WATER IN MAIN CYLINDER
WATER IN FLOAT
RECORDING APPARATUS

The tube is connected to the "works" which automatically record variations in pressure.

It is not easy to discover the speed of the wind, and it is necessary to know variations in speed from minute to minute. Two main types of anemometers (instruments for measuring the speed of the wind) are in use at weather stations—the cup-type anemometer and the pressure wind-gauge shown in this diagram sketch.

THE top of this instrument resembles a wind-vane, but what would in an ordinary vane be the point of the arrow is an open tube. The vane, being blown round, keeps the opening facing the wind constantly.

The wind thus always blows into the tube, which leads down to the recording mechanism below.

Also located in the exterior apparatus is a box with small holes, in which the wind causes a decrease in pressure (or suction). This box is attached by means of a suction pipe to the recording mechanism, where its action reinforces the action of the pressure tube.

GAUGE CONSTRUCTION

Variations in wind pressure are thus sensitively recorded. The gauge itself consists of a cylinder half-filled with water, in which an inverted vessel floats. A rod passes up through an airtight collar to support a recording pen, which inscribes a chart on a drum that is revolved mechanically.

The pressure tube from the head of the anemometer comes up inside the inverted floating vessel.

Increased air pressure resulting from stronger wind tends to lift the float by forcing more air into the float, while the suction pipe leading from the top of the cylinder reinforces this effect by decreasing air pressure in the vessel.

As the float moves up and down in conformity with varying wind-pressure, rises and falls are recorded on the graphed chart.

TRUE RECORD

As the wind never blows steadily, but is always fluctuating, this type of gauge gives a true record of its changing speed, with every gust and lull noted.

The chart is removed and replaced periodically and its recordings are noted by weather experts. It is possible to read off **exact wind speeds** from the chart.

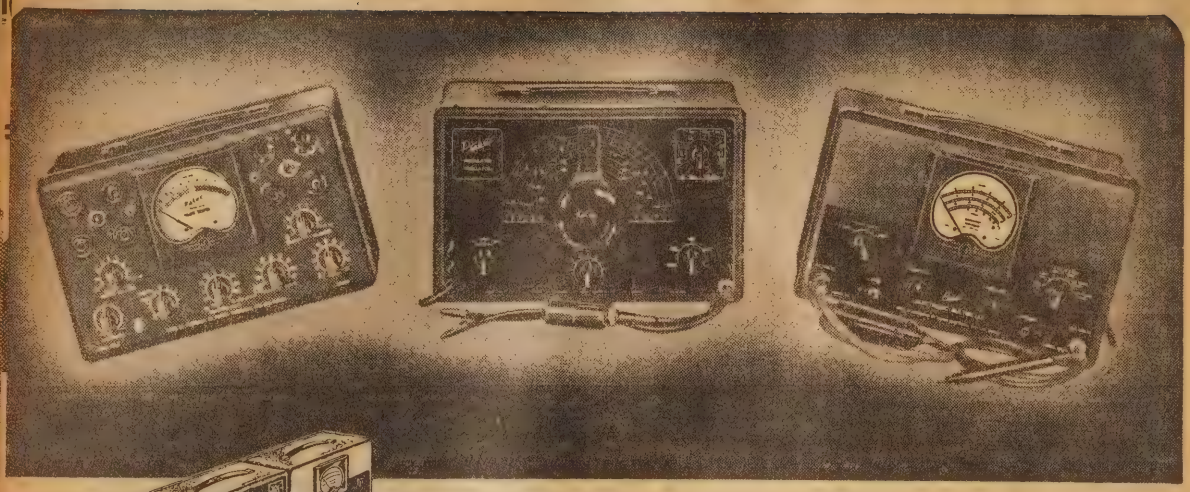
The cup anemometer is less satisfactory as there are several sources of error, the chief being due to inertia. The device tends to gain speed slowly as the wind increases.

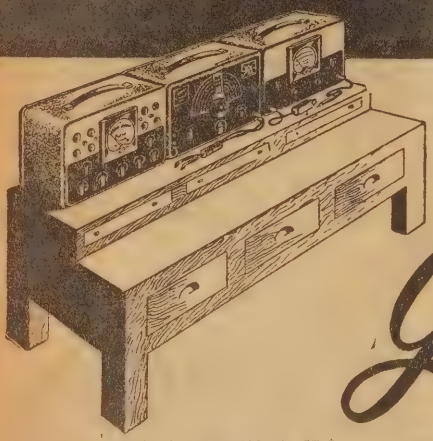
Sometimes the anemometer has attached to it an electrical recording device that can be placed in a room far away from the exposed place where the transmitter is fixed.

It is essential that an anemometer should be placed in a position well away from buildings or trees, so that nothing can obstruct the play of the wind on the instrument.

PORCELAIN FOR TURBOJETS

POSSIBLE answer to need for heat and stress-resistant material for gas turbines and rocket engines is an all-crystalline porcelain recently announced by the US Bureau of Standards. The new porcelain resists temperatures up to 1800 deg. F., stresses up to 14,000lb. psi. Immediate application may be in rocket nozzles. It does not contain silica, but does contain alumina, beryllia, zirconia, thoria and other metallic oxides.





THESE three essential units make an impressive showing and supply complete coverage for the quick and effective diagnosis of all radio problems. They also have the advantage of being individually self-contained and readily portable for outside service. Do more and better service in the competitive days ahead. Do it quicker, more profitably!

Goodbye TO GUESSWORK!

THE PALEC VALVE TESTER, MODEL ET-3

This compact, efficient valve tester, the latest model in the new series of Palec test instruments, is eminently suited for workshop, counter or portable use.

FEATURES:

Good for years to come. Selection of filament pins, irrespective of position on base, with full floating element selector switch—only one socket for each valve type necessary. Takes standard American valves, 7-pin button base and P and V Continental.

Wide Heater Voltage Range. Inbuilt filament transformer covers all filament voltages from 0.6 (deaf aid series) to 117 volts, catering for all oversea and local valves.

Neon Shorts Test. To conform with valve manufacturers' recommendation, comparatively low voltage is employed (50 volts max.) for this test. This prevents danger of short developing between grid and filament due to electrostatic attraction where normal striking voltage of the neon is applied to valve elements. Particularly applies to testing of 1.4 volt range of valves and is an exclusive feature.

General. Complete valve data booklet supplied, listing over 800 valves.

Price: £19/10/-, plus tax.

MODEL M.O. MODULATED OSCILLATOR

Range, 15 K/cs—30 M/cs in six direct reading bands.

Vernier Dial 54:1 ratio, calibration accuracy 1%.

Has cathode follower to prevent frequency modulation and attenuator reaction.

Signal generator pattern attenuator of five steps: impedance 11 ohms on lower settings.

Triple shielding and adequate filtering ensures a leakage of less than 1 microvolt at all frequencies.

Supplied complete with detachable dummy antenna, co-axial leads and 24-page instruction book.

Price: £32/17/6, plus tax.

Note: Each of these instruments is A.C. operated, 200-260 volts, 50 C.P.S., and can be operated from a battery by using external vibrator unit.

Price: £4/17/6, plus tax.

All prices are nett trade and plus tax. Subject to alteration without notice.

Available at leading wholesalers in all States.

PALEC Model V.T.M. (Probe) MULTIMETER

Ranks as most versatile and valuable single piece of test apparatus.

Checks and tests all circuits, R.F., A.F., A.V.C., under operating conditions without disturbance.

Capable of quickly locating most obscure and elusive of intermittent, noisy, open or short circuits.

Checks all component parts and tests for high resistance insulation leaks.

Used with Model M.O. oscillator or equivalent, traces signal and determines stage gain in every channel from mixer to speaker.

Note: Oscillator employed must have good attenuator characteristics. *Ranges:*

(1) R.F.-A.F. six-range voltmeter: 0-2.5-10-25-100-250-1,000 volts A.C. Fitted with polystyrene bushed probe operating on frequencies up to 300 M.C. accuracy ± 0.5 db. to 100 M.C. Input cap., 10 uuf., loading equal to 6 megohms.

(2) High resistance D.C. six-range voltmeter: 0-2.5-10-25-100-250-1,000 volts D.C. Total load 11 megohms—giving over 4 megohms per volt on lowest range.

(3) Ohmmeter, six-range — from 0.5 ohms to 1,000 megohms.

Detachable co-axial leads, 20-page instruction book supplied. Employs 4 valves. Price: £29/10/-, plus tax.

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P.18.FP

NEWS AND VIEWS OF THE MONTH

WE can scarcely allow an issue to pass without making some reference to the flying saucer episode. It will probably rank with the famous hoaxes of the world's history, along with the mystery of the Loch Ness monster and the Marie Celeste.

It is quite obvious by this time that most, if not all, the reports concerning saucers were little more than figments of the imagination, aided by the well-known tendency of people to see things which they are interested in seeing.

But not quite. We must be a little more realistic in a matter concerning which it is not hard to find some element of truth.

Elsewhere in this issue will be found a picture of a genuine flying saucer —an aircraft which in the air would look exactly like an amimated piece of crockery.

It is perfectly feasible to assume that the whole thing started when someone actually observed an experimental aircraft making a flight. As with so many advanced designs, secrecy is most desirable, but often hard to achieve. Assuming this was the case, however, the best method of confusing the issue concerning what really was seen would be to encourage as much as possible the wildest and most absurd claims of observation with the express purpose of completely clouding the issue.

LET THEM GUESS

We are quite certain that the USA military authorities would jump at the chance of providing a few phoney saucers for the convenience of the public, and of doing all they could to encourage, in a tactful manner, of course, the idea that they knew as little about the matter as anyone else.

Even in the unlikely case of the saucers being of foreign origin, one of the first principles of Intelligence is to keep others from knowing how much you yourself know about their activities. This is often more important than letting them know how clever you are.

The net result is simply that no one is likely to hear the full saucer story for many years to come, and even then, it may not be policy to reveal all.

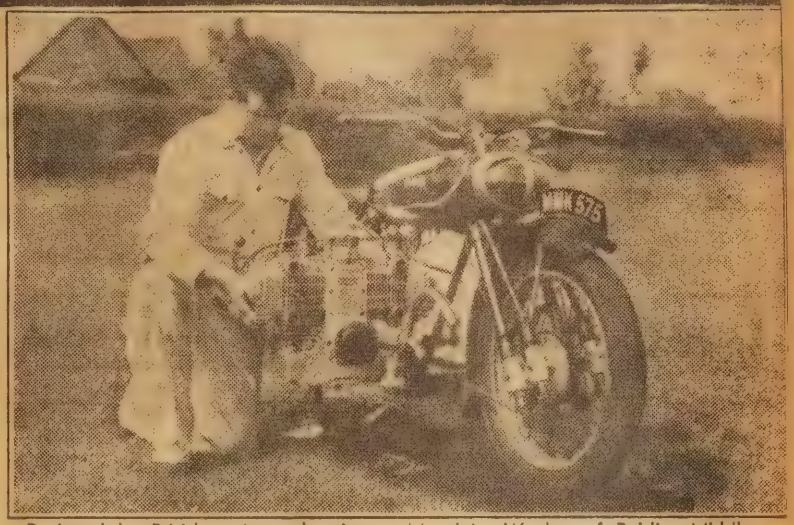
But weren't you impressed with the ability of untrained observers to estimate heights up to 10,000 feet, plus speeds and sizes, day or night being of no consequence? Truly human nature over the ages varies but little in some things.

Frogs and Sound

BULLFROGS can make more noise than a North Atlantic winter storm, says scientists at Palo Alto, California.

The scientists are studying underwater sounds in preparation for submarine atomic warfare.

The American Physical Society,

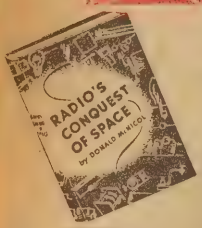


Designed by British motor-cycle pioneer Mr. John Wooler, of Ruislip, Middlesex, a new shaft-driven four cylinder 500 c.c motor-cycle may revolutionise motor-cycle building in Great Britain. The machine, which has a five-horsepower engine, can be dismantled in four minutes and twenty seconds—and re-assembled ready for starting in three minutes and fifty five seconds.

Edwin H. Land, discoverer of Polaroid, peels apart the positive (top) and negative (bottom) of a picture of himself during his demonstration in New York City, Feb. 21, of his process through which a finished photograph can be delivered a minute after a picture is snapped. The picture was made on a regular 8 x 10 studio camera with a special back containing Land's invention. Picture was made by synchronised flash with two number 22 flashbulbs with the lens stopped down to F 50.

RADIO BOOKS

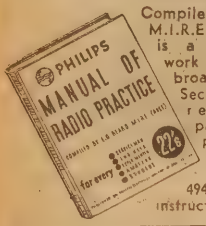
INSPECT THIS LIST TAKEN FROM ANGUS & ROBERTSON'S LARGE RANGE OF THE LATEST TECHNICAL BOOKS!



1. The Story of the Rise of Radio
RADIO'S CONQUEST OF SPACE

The personalised history of radio. The men, the problems, the gradual development of radio woven into an interesting, essentially non-technical story. Written by Donald McNicol with fifty years of radio experience. 374 pages, illustrated. 30/- (post 10d.)

2. PHILIP'S MANUAL OF RADIO PRACTICE FOR SERVICEMEN



Compiled by E. G. Beard M.I.R.E. (Australia.) This is a strikingly complete work covering radio and broadcasting today. Sections on reception, receiver technique, principles and components, service, tables and charts, valve data, etc. 494 pages of helpful instruction. 22/6 (post 1/2.)

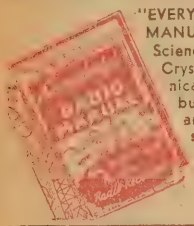
3. New Edition of Drake's CYCLOPEDIA OF RADIO AND ELECTRONICS

12th edition of the book that has kept abreast of all latest developments right up to the present radar, F-M radio, and electronics in industry. Easily understood. In alphabetical order with hundreds of diagrams and charts. 42/- (post 1/2.)

4. For Testing Radio Receivers PRACTICAL WIRELESS SERVICE MANUAL

Written by F. J. Camm, this book is the MANUAL of radio servicing. Simple testing for the amateur and modern methods for the professional. Covers all faults and quick diagnosis. 13/9 (post 5d.)

5. HOW TO BUILD AND REPAIR RADIO RECEIVERS



"EVERYBODY'S RADIO MANUAL," a "Pop. Science Monthly" publ. Crystal clear, non-technical instruction on building or repairing any kind of set. Hints, short-cuts, a wealth of diagrams that are easy to follow. 256 pages. 7/6 (post 6d).

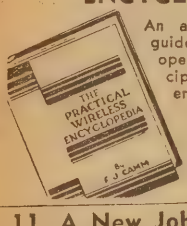
6. Get This Complete RADIO SERVICING COURSE TODAY!

"Modern Radio Servicing"—by A. A. Ghirardi; one of the foremost servicing experts in the U.S.A. 1300 pages, 706 illustrations. Everything is explained clearly, simply, step-by-step. Trouble shooting, testing and servicing all types of home and auto-radio equipment 40/-. (post 1/3.)

7. SIMPLIFIED RADIO!

"The Outline of Wireless." By R. Stranger. One of the most popular books about radio ever written. Covers the whole field of radio thoroughly. A highly scientific subject discussed in simple language. 836 pages. 578 "easy-to-follow" illustrations 17/6. (post 10d.)

8. Ninth Edition of F. J. Camm's "THE PRACTICAL WIRELESS ENCYCLOPEDIA"



An alphabetically compiled guide for the construction, operation, repair and principles of wireless receivers. Over 220,000 copies sold. Definitions, explanations, formulas, etc., rapidly consulted. 12/6 (post. 6d).

9. COMPLETE RADIO MANUAL

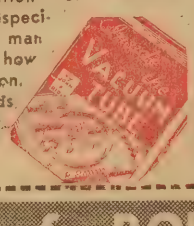
Instructions for 67 receivers, recorders, radio photographs, etc., from one tube to 8 tube sets, from vest pocket to floor models. Trouble-shooting, servicing, testing equipment 100 wiring diagrams, 450 illustrations. 10/6 (post 6d.)

10. Completely Revised Edition "RADIO HANDBOOK"

New edition of the original "Jones' Radio Handbook." Latest information on dozens of wartime developments, F.M., U.H.F., Tube design, etc. 704 pages, hundreds of diagrams. 17/6. (post 1/-.)

11. A New John Rider Book! 'INSIDE THE VACUUM TUBE'

By John F. Rider. A complete easy-to-understand explanation of vacuum tube fundamentals especially written for the man who wants to know how Vacuum tubes function. 424 pages, hundreds of diagrams—just out.



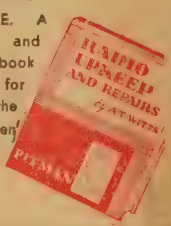
36/- (post 10d.)

12. An Introduction To FREQUENCY MODULATION

By John F. Rider. This book is an introduction to frequency modulation with special attention given to F-M receivers and the general maintenance problems with which the servicemen will doubtlessly be confronted in the very near future. 142 pages illustrated. 16/- (post 6d.)

13. RADIO UPKEEP AND REPAIRS

By A. T. Witts A.M.I.E.E. A thoroughly practical and highly popular hand book on fault maintenance for the radio mechanic, the servicemen, and the keen amateur. 6th edition 237 pages, 166 figures 1944 11/- (post 6d.)



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..... (Tech. R.H. 8/47)

meeting at the University of California, found that noise interference by natural life below the surface of the sea made most delicate sound-detection instruments useless.

Lobsters snapping their claws, shrimps scrapping along the sea bed, and bullfrogs by the hundreds of millions are the most annoying forms of submarine life to scientists.

Scientists found that 400,000,000 bullfrogs in Chesapeake Bay (California) made a noise which measured 119 decibels.

The howling winds of a North Atlantic storm register only 86 decibels, a busy street registers 85 decibels, the average office 75 decibels, a boiler factory 112 decibels.

Scientists say that the drumming of the bullfrogs makes a noise "not unlike woodpeckers on a dry telephone pole."

The oversized shrimp makes the most annoying sounds.

One scientific report said: "The snapping of their enlarged claws makes a noise like the crackling of burning twigs. If there is a large colony, their noise resembles frying fat."

Organised U.H.F.

AFTER some months absence from the band, we cranked up the old transmitter on the 20-metre amateur band the other weekend, and soon made contacts with a number of well-known calls in the USA.

That's quite normal, of course, but one thing that has impressed us considerably is the active interest the Americans have in 50 mc. operation in Australia. At the mere mention of this band, two out of three contacts have resulted in discussion about what we are doing here, and what we propose to do.

It is all the more encouraging because the average 20-metre phone man in USA is not normally very interested in such matters. But it is pretty certain that other VK's who might have referred to 50 mc. in other band contacts will have noticed the same thing.

We have a great opportunity now to commence some active organisation in anticipation of finally breaking out of Australia with some clean, confirmed UHF contacts.

ORGANISED ACTION

In Victoria and New South Wales at least, the WIA has very active UHF sections. We suggest to these sections that they get together, and see what can be done in the drawing up of rosters to be put into operation a little later on.

The ordinary listener-in, too, can help, and find great interest in listening for these signals. Short-wave enthusiasts will get just as much fun from using a small converter attached to their sets as will the men who are able to reply to anything that comes along.

The time to arrange all these things is the present. Elsewhere in this issue you will find a list of stations and frequencies for NSW amateurs operating on 50 mc. We will be pleased to give publicity to similar lists from other States, in an effort to make the information known over as wide a field as possible.

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it's positively NOISELESS
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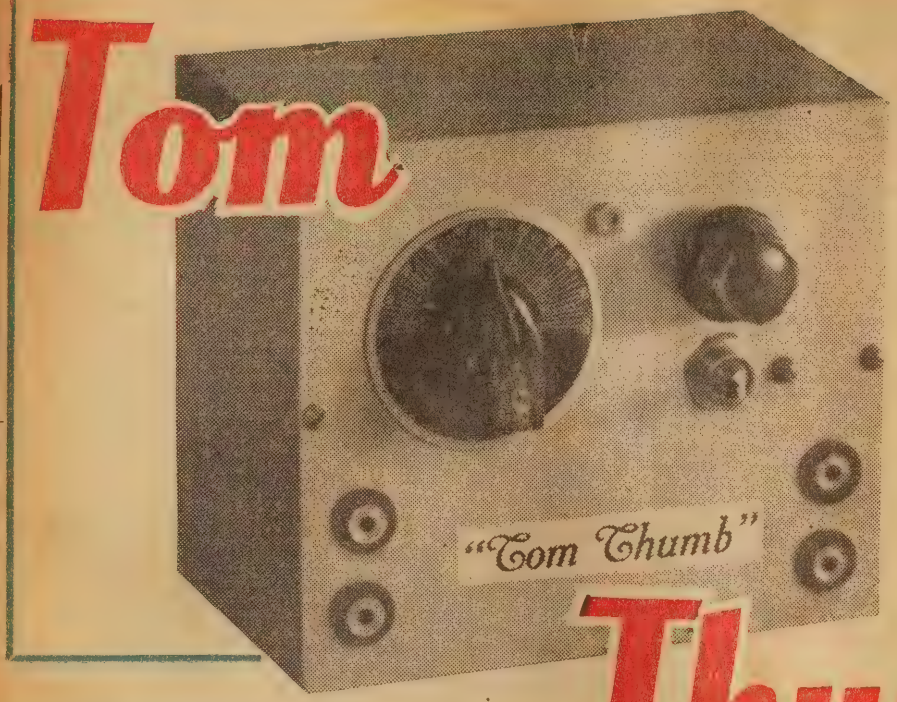
Tom Thumb!



This picture of "Tom Thumb" reveals a nicely balanced front panel, and a cabinet which will fit into your hand. You can easily make it, finished in any color you please.

We have called this receiver "Tom Thumb" because he is the perfect electronic equivalent of the character made famous in nursery rhyme. He "pulled out a plum" with a vengeance by tuning in all the locals on a loud speaker with a four foot aerial. Packed into a cabinet about half-brick size is a two-valve marvel complete with batteries. Hard to believe?—Build one and see! We say advisedly that "Tom Thumb" is the neatest, handiest little set we have ever built.

YES, we are really steamed up over "Tom Thumb."

He was planned and built in our workshop in the same impersonal fashion as any other set and taken out into the suburbs to see what he could do. That's when he really exhibited a personality.

When coupled to a large aerial, earth and to a pair of earphones, just like any other regenerative set, the local stations made the earphones dance so madly that we connected a loudspeaker. Tom played on quite happily, even with a short aerial and no earth wire. We just couldn't keep him quiet!

SMALL COMPONENTS

But, lest we give the wrong impression, there is nothing miraculous about the "Tom Thumb" circuit. It is a happy combination of small physical size with an efficient two valve regenerative circuit. A little set with just the right ingredients to make it a real hit with our readers. We can imagine nothing better for hikers, cyclists, campers, or anyone else who cannot cope with the weight and bulk of an ordinary radio set.

And the ubiquitous commercial traveller will like him, too. "Tom" can be tucked down among the samples and brochures, taking up hardly any room, but ready to brighten the evening hours in the country "pub."

The design of this new receiver was made possible by the release of a miniature B battery, button type valves and, last but not least, the single gang "Minicap" condenser. None of these parts are strictly new, in terms of a few months, but only now does the supply position look bright enough to warrant the description of a receiver using them.

Readers have occasionally taken us to task for our apparent oversight in not describing a whole range of miniature receivers, but we always try to adopt a realistic attitude in these matters. It is quite true that a few button type valves have been on sale, that there have been miniature coils and I.F. transformers available, some small gang condensers, small speakers and other such items.

by Radio and Hobbies

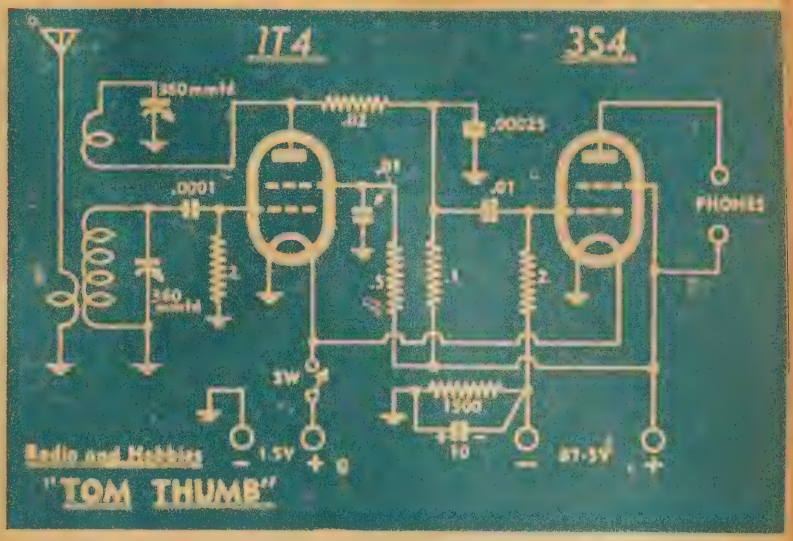
SUPPLY PROBLEMS

Like everyone else, we have seen and handled these components and then been told "supplies should be available within three months," or "they are now awaiting shipment." Therein lies the catch. It is one thing to build up an individual receiver from odd parts which one may happen to pick up. It is quite another thing to design a set which several hundred or thousand readers will have a reasonable chance of duplicating.

Then there is another point. Building a miniature set is quite a different proposition from the usual run of "Standards" and "Little Generals." Contacts are very close together and some skill in the gentle art of soldering is essential if short circuits are to be avoided. Space is at a premium and parts have to be installed systematically and efficiently if they are all to be fitted in without causing feedback problems.

Some of the miniature American receivers—4 and 5 valve superhets which fit into a coat pocket—are a lesson in compactness. Everything is on a small scale, even the re-

TOM THUMB CIRCUIT DIAGRAM



The circuit diagram at the right looks much like any other simple two-valver. The secret of size and success is the manner in which the latest miniature parts are used.

Our smallest receiver

sistors and condensers. The whole lot assemble into a case which is specially stamped out for the job. However, much water will flow under the bridge before home constructors in this or any other country can produce standardised designs comparable with the mass-produced miniatures.

But "Tom Thumb" is a definite step in that direction. Mechanically, it is extremely simple, and the complete receiver, exclusive of loud-speaker or earphones, fits into a small rectangular cabinet which any handyman can knock together from scrap wood. The accompanying illustrations show all the details necessary for fashioning the chassis components from sheet aluminium.

CAREFUL WIRING

The most difficult part is in the wiring of the receiver, although even this calls for no more than ordinary skill in the use of a soldering iron. Clean, neat joints are required, and the various resistors and condensers have to be fitted carefully into the available space. The coil may need to be modified slightly, but none of these problems are beyond the capabilities of anyone who has built a couple of receivers.

To begin with, you will need a piece of 18-gauge aluminium, measuring 5in. x 4½in., which should be drilled as indicated in the drawing. This forms the front panel.

The base plate of the assembly is a 3½in. x 4in. section, with a ¾in. upward fold. This is drilled as necessary and bolted to the front panel. It carries a second angle bracket bent from a 1 1-8in. x 1 7-8in. section, which mounts the two valve sockets. The fourth and final item is a scrap of aluminium measuring approximately 3½in. x 1½in., rolled into a three-quarter circle a little under an inch in diameter. This holds the torch cell supplying the two filaments.

Once suitably drilled and bent, the brackets and front panel can be assembled preparatory to mounting the other components.

The tuning condenser is one of the new "Minicap" single gang units which have just been released. These have very thin brass plates separated by a solid dielectric, and the method of construction allows the required 400 odd mmfd. of capacitance to be obtained in a unit only about half an inch thick. The difference in size between this and an ordinary single gang condenser is obvious.

Solid dielectric condensers of this type are not new, by any means, but they have not been used to any extent for some years. The use of a solid dielectric introduces greater losses than are apparent in an air condenser, but, for certain applications, it is a price worth paying for the greatly reduced size.

In a regenerative set the losses are apparent in reduced liveliness of the

PARTS LIST

1 Panel 5 x 4½in.
1 Base plate and brackets (see text).
1 Reinartz coil.
1 Off-on toggle switch.
2 Button type valve sockets.
2 Midget single-gang tuning condenser (.00036 mfd).

RESISTORS

2 2 meg. 1/3 watt., 1 .5 meg. 1/3 watt, 1 .1 meg. 1/3 watt.
1 20,000 ohm 1/3 watt, 1 1500 ohm 1/3 watt.

CONDENSERS:

1 10 mfd. 40 P.V Electrolytic, 2 .01 mfd. mica.
1 .00025 mfd. mica, 1 .0001 mfd. mica.

VALVES:

1 1T4, 1 3S4.

HEADPHONES:

1 Pair, 4000 ohm.

BATTERIES:

1 1.5 volt torch cell (type C).
1 67½ volt Minimax "B" battery.

SUNDRIES:

4 small pin-jacks with insulating washers, 1 small knob, 1 pointer knob, 1 small 180 deg. scale for dial, hookup wire, spaghetti, nuts and bolts, etc.

action circuit. This is offset in part sing a second identical condenser reaction control, the higher capaance assisting materially in mainning oscillation over the whole band. any case, the condenser is still only third of the size of an ordinary airelectric reaction condenser.

ONDENSER MOUNTING

The tuning condenser is mounted to e left of the front panel, a 180gree indicator scale being locked in ace by the mounting nut. The spindle ould be cut off to the required ngth and then fitted with a black inter knob. The direct drive necesates careful tuning, but is not unly critical to handle.

The reaction condenser mounts to e left and is controlled by a small ob. The "off-on" switch is directly derneath, which brings the switch ntacts very close to the positive terinal of the torch cell "A" battery.

As previously mentioned, the torch ll is held in place by a circular alumium clip bolted to the baseplate. The ll should be slipped out of its cardard case and pushed into the metal eeve, so that the A-minus connecon is automatically made to the chas-. The positive terminal can be con-ected to the switch by a short length wire, the only disadvantage being at a soldering iron has to be availble when replacing the cell.

Alternatively, a clip may be fashned from spring wire to grip the end the cell, or a brass contact soldered the switch lug against which the ll can bear when it is pushed into lace. Please yourself what you do bout this, but it is obviously handy a new torch cell can simply be ushed into place whenever replaceent becomes necessary.

Incidentally, we used the second size orch cell for compactness. The larger 2 type cell will just about fit in and is aturally to be preferred as far as fe is concerned. Here again there is oom for individual choice.

The valve sockets can be mounted in lace, and the two insulated pin-jacks n either side of the front panel. We sed the two to the right for the aerial nd earth connecions, and the other wo for the earphones. The space etween them is just large enough to ccommodate a 67½ volt miniature Battery, which sits snugly beneath the hassis plate.

The B-battery leads can be soldered irectly to the terminals or fitted with the necessary glove type fasteners, if these happen to be available. Note that the battery should be placed so that the terminals are adjacent to the earphone connections.

Be very careful about the insulation of the earphone terminals, as a short circuit to chassis will ruin the B-battery in double quick time.

Study the circuit carefully before you begin the actual job of wiring. It is a straightforward regenerative job with a 1T4 detector and a 3S4 pentode output valve. The detector circuit is quite conventional, the only unusual item being the substitution of a 20,000 ohm resistor for the RF choke in the detector plate circuit.

THE initial test of "Tom Thumb" on a loud speaker was carried out by the Technical Editor at Merrylands. As a double check, your Editor tried him out at Potts Point with an "aerial" connected to the refrigerator, and an old type "Brown" loudspeaker. All Sydney stations were heard at good strength, plus many interstate stations at varying degrees of loudness. These old-time speakers are very sensitive, and are just the thing to make the most of a modest output. There was no interstation interference.

RESISTORS

All the resistors should be of the third-watt variety and mica bypass condensers are used throughout for compactness. Very small mica condensers are available and these should be used wherever possible. The only large item among the wiring parts is the 10 mfd. electrolytic condenser, which cannot well be avoided.

As far as the tuning-coil is concerned, we elected to use a standard commercial unit, as it was obvious that a hand-wound coil could not compete in compactness and efficiency. As matters turned out, it was not necessary to remove the base plate carrying the lugs. The coil was simply removed from its can and mounted by passing the top screw through a hole in the front panel. The upper edge of the baseplate was trimmed down with a file to clear the top of the cabinet.

Be sure to wire the coil according to the makers' coding. Other types differ as far as connections are concerned from the type used in the original set and shown in the wiring diagram.

The detector socket is the one to the rear of the chassis, and, therefore, close to the coil lugs. The detector grid components and wiring can be kept towards the back of the chassis, with the output plate lead adjacent to the front panel. The space between and behind the sockets is then available for the other wiring components.

YOUR SOLDERING IRON

Before you begin the actual job of wiring the set, file your iron tip to a long tapering chisel point and carefully tin it. It is practically impossible to make a neat job with a blunt and dirty iron.

Begin by wiring up the filament circuit, using plastic hook-up wire for preference. A little practice with a sharp knife or razor blade will teach you how to nip off the last quarter-inch of insulation without damaging the wire strands. By following this technique, very neat joints can be made.

The 3S4 has a centre-tapped filament which allows the two halves to be operated in series or in parallel, as required. The parallel connection is used here, so that pins 1 and 7 are bridged across and go to A-plus, while pin 5 goes to earth. Note also that the central metal sleeves in the sockets should be earthed for shielding purposes.

Wire up the detector grid circuit next and put in the leads to the tuning coil. After that the various other leads, such as the output valve plate and screen wires should be added, since there is little chance of locating them after the wiring parts have been grouped behind the sockets.

SOCKET WIRING

Pin 1 of the detector socket is used as a handy earth return point for some of the components. Put in the detector grid resistor first, connecting it between pins 6 and 1, tucking it well down alongside the socket. The screen bypass is immediately behind it, connecting between pins 1 and 3. The screen feed resistor fits above the sockets, connecting from pin 3 on the 1T4 socket to pin 4 on the 3S4 socket.

The coupling condenser mounts end on to the screen bypass and immediately behind the 3S4 socket. One wire connects to the 3S4 grid pin (pin 3), the other wire being bent vertically upwards for connection to the two resistors in the plate circuit of the 1T4. The 0.1 meg. resistor runs along the top edge of the coupling condenser to the screen pin (pin 4) of the 3S4, while the 20,000 ohm resistor runs along the edge of the other condenser to the plate pin of the 1T4.

The .00025 mfd. plate bypass passes from the junction of the three components mentioned above to the A-minus pin of the 1T4 valve, which is earthed.

Next component to put in is the 1500 ohm back bias resistor, which sits atop the 1T4 plate bypass. One end connects to the A-minus lug on

Call Sign and Short Wave Handbook

OUR new publication which should be available about the end of August is now taking shape. It will include all Australian amateur and broadcast station lists, overseas stations audible here, and articles on short-wave and ultra short-wave receivers, transmitters, aerials, etc. Approximate size will be 80 pages and it will sell in a heavy-weight colored cover for 2/- per copy.

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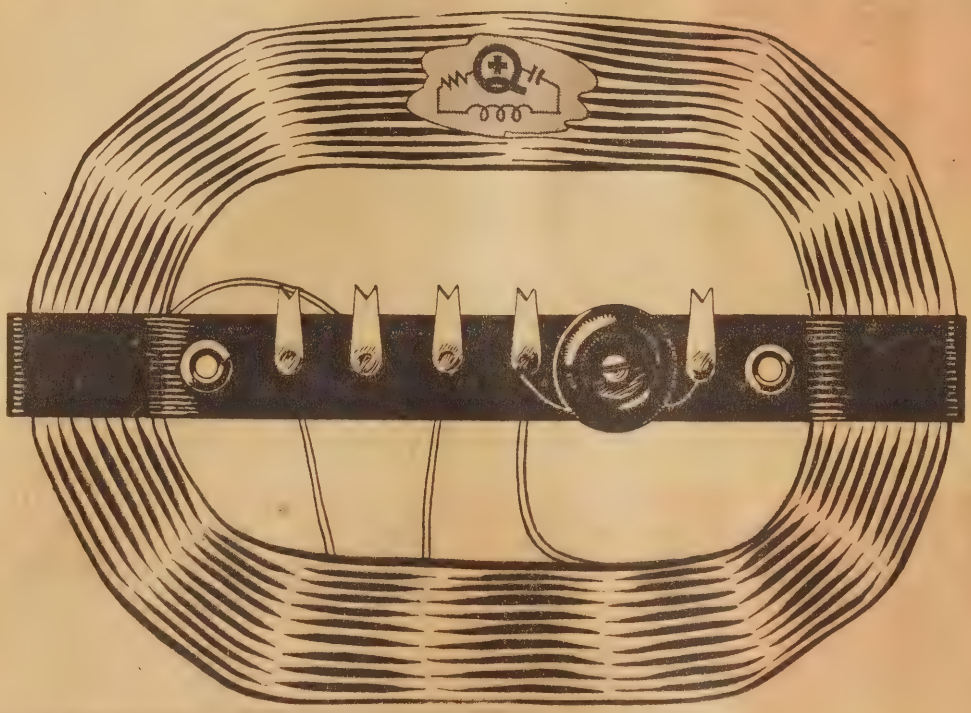
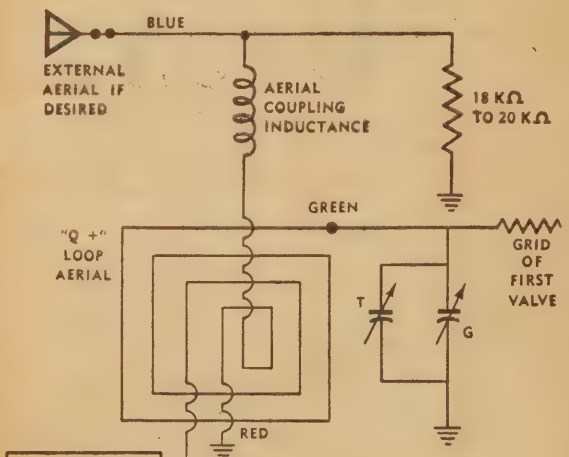


RECOMMENDED CIRCUIT FOR USING "Q PLUS" LOOP AERIALS



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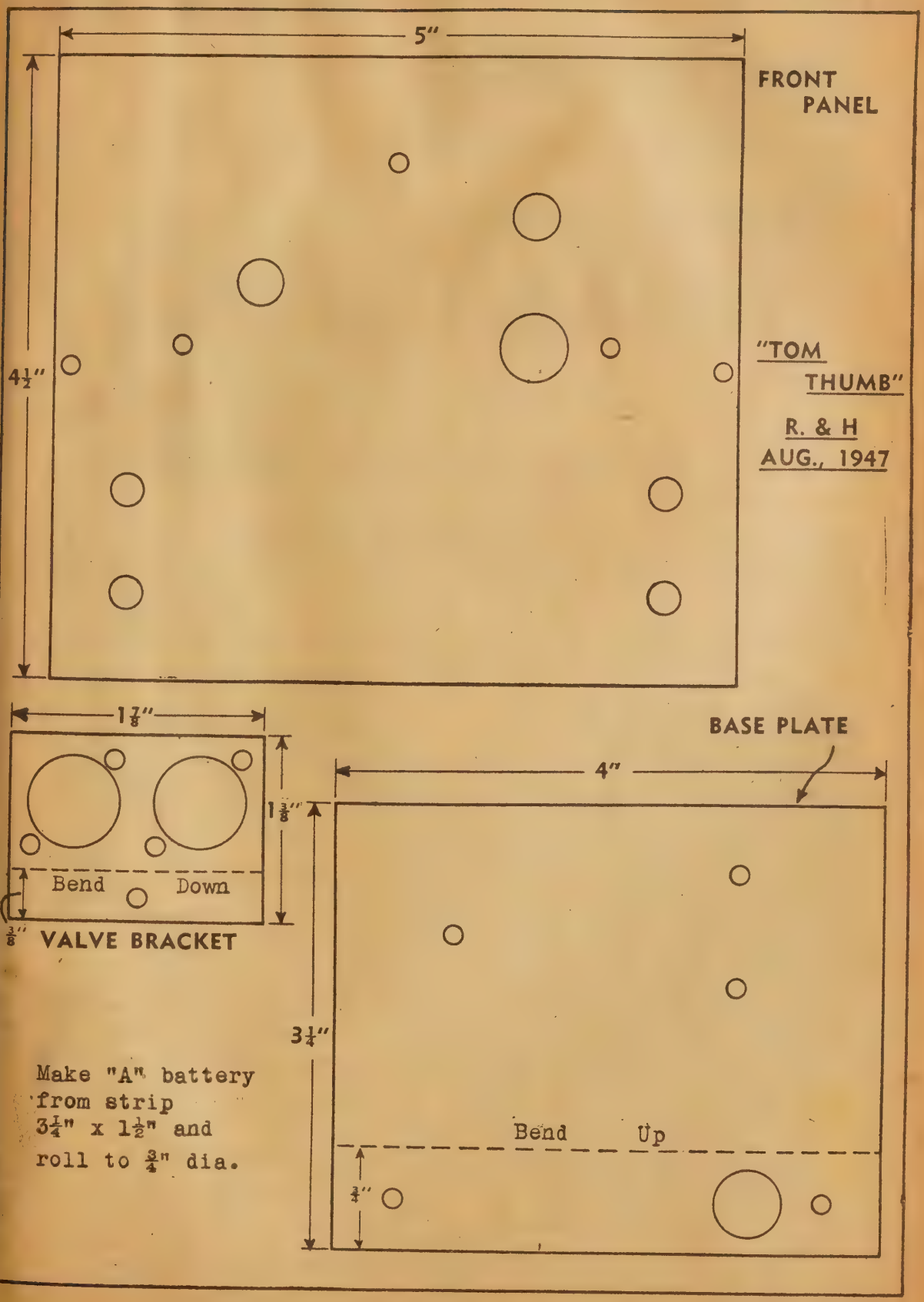

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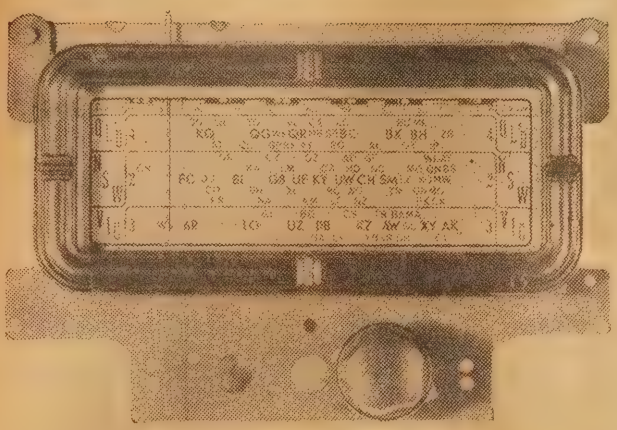

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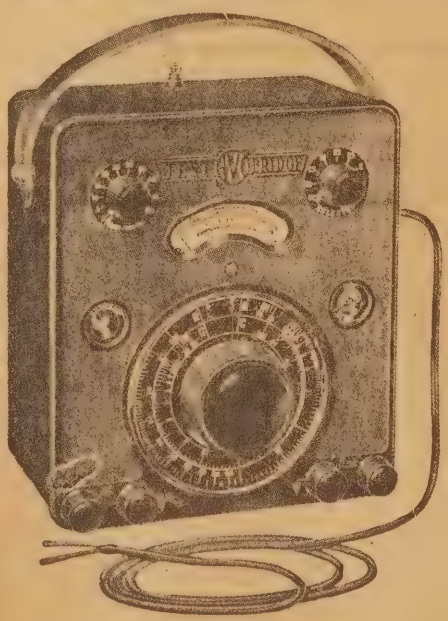

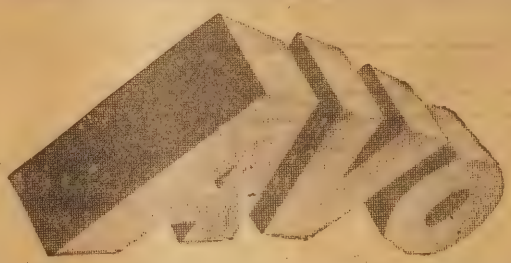

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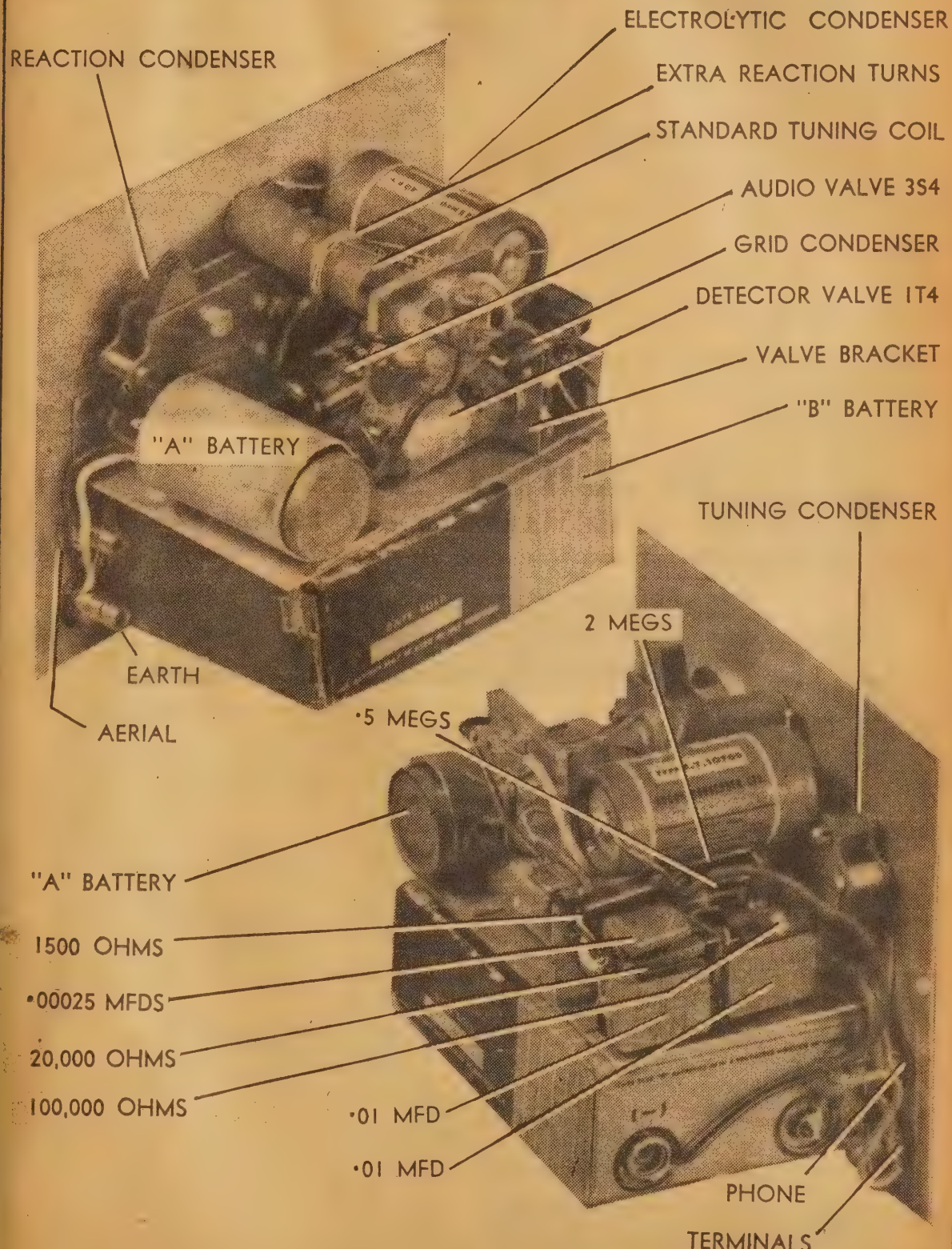

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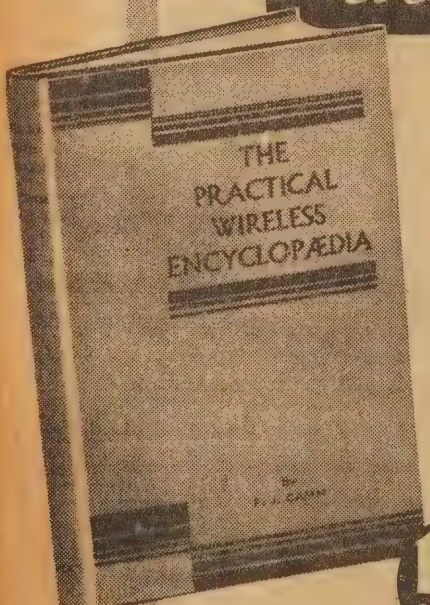
Everyman's Guide to Radio



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the 1T4 socket and the other end to a 1.0 meg. resistor going to the grid pin of the 3S4. From the junction of these two resistors the 10 mfd. electrolytic runs to an earth lug which we mounted beneath the mounting screw of the tuning coil. Note that the positive end of the condenser goes to chassis. The B-minus lead to the battery runs from the junction of the two resistors and the 10 mfd. electrolytic.

From the above description and the various photographs it should be possible to duplicate almost exactly the layout of the original set. There are, doubtless, other ways of fitting the parts in, but the arrangement suggested is orderly and logical.

CIRCUIT CHECK

On completion of the receiver, check the wiring over very carefully, making doubly sure that there is no possible inter-connection of the high tension and filament supplies. Connect up the phones, B-batteries, aerial and earth, and, if possible, check the filament voltage with a voltmeter or a test lamp. Then plug in the valves and switch on.

In the vicinity of strong local stations there may be a tendency for them to run together, due to the naturally limited selectivity of this type of set. Either remove the earth connection or use a shorter aerial to strike the best compromise between gain and selectivity. As we stated earlier, we found that all the local stations could be tuned at fair strength with an earth wire connected and using only from four to six feet of aerial wire.

The earth is quite important in a battery set and, if not used, would have to be offset by employing a longer aerial wire.

COIL DETAILS

It should be noted that most "Reinartz" type aerial coils have two aerial connections, marked for short or long aerial. You can also experiment with these to find the exact results they give in your location and with the aerial system it is proposed to use.

These remarks apply mainly for purely local listening. Away from the city the signal strength of stations drops rapidly and a longer aerial and an earth wire are both essential for good results.

Whatever happens, your set will be of little use unless the reaction circuit operates properly. In this set, the activity of the reaction circuit is affected somewhat by the inevitable losses in the tuning condenser, and we found that there were simply not enough reaction turns on the particular coil used to ensure oscillation over the whole band.

To correct this condition, we located the reaction winding, unsweated its outer connection from the base connecting lug and, by carefully peeling the wire up through the wax coating, noted the direction in which the coil was wound. A few feet of fine wire was then connected to the loose end and about 25 more turns added, scramble wound, over the existing re-

(Continued on Page 89)

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20-LINE TABLE MODEL.

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Whatever your communication problems may be, Maxwell engineers can solve them for you, and, when installing a sound or telephone system may we suggest you purchase your equipment outright, because it then becomes a CAPITAL INVESTMENT . . YOUR PROPERTY . . and IT IS 75% CHEAPER than RENTAL!

Just drop us a line on your business letterhead, and our representative will be pleased to call and discuss your particular problem with you.

MAXWELL Communications
(Inc. William Blogg)

25 McLACHLAN AVENUE, RUSHCUTTERS BAY, SYDNEY. FA1274.

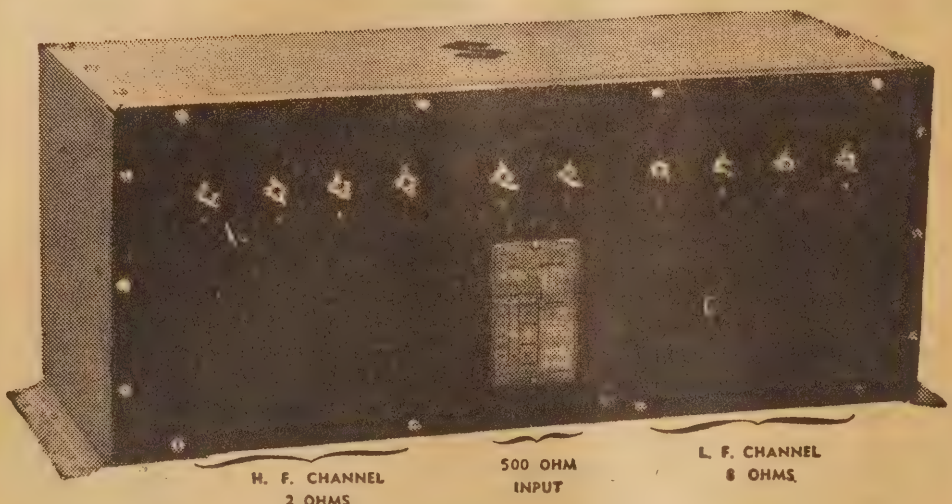
VICTORIA—Speakeasy Telephones, 43 Clarence St. East Malvern, Melbourne. UL6271.
WEST. AUSTRALIA—Atkins (W.A.) Ltd., 894 Hay Street, Perth [illegible] 8315.

MAXWELL COMMUNICATIONS

RED LINE

EQUIPMENT

FREQUENCY DIVIDING NETWORKS



GENERAL

Type D482 is specifically designed for High Fidelity radio gramophones and small talking picture sound installations. The unit consists of a shunt type cross-over network using high "Q" inductances and is intended for insertion in a 500 ohm line. Loud speaker input transformers are incorporated in the unit, the voice coil winding being brought out for each channel to 4 terminals for connection either in series, for conventional operation, or in parallel for use with loading resistances for medium and high power circuits with wide range characteristcs such as the "Full Frequency Range Amplifier"* This latter method will present what is virtually a constant load to the output tubes with an extremely high damping factor and lead to a marked improvement in transient response.

* *Reprints of the articles describing design and construction of this amplifier are available in pamphlet form from:—*

SPECIFICATIONS

OPERATING LEVEL: Plus 39 db max. INSERTION LOSS: Approximately .5 db. CROSS-OVER FREQUENCY: 500 cps. ATTENUATION: Low frequency channel—20 db at 1200 cps. High frequency channel—20 db at 150 cps. INPUT IMPEDANCE: 500 ohms. OUTPUT IMPEDANCES: Low frequency channel—8 ohms. for 1 "Rola" Type G12. High frequency channel—2 ohms. for 1 "Rola" Type 8M (if parallel connected, output impedances will be 2 ohms and .5 ohms and require to be shunted with resistances of 2.67 ohms and .66 ohms respectively.) FREQUENCY RESPONSE: (Both Channels.) Within 1 db from 30 cps. to 12,000 cps. WEIGHT: 18lbs. SIZE 13 x 5½ x 5.

List Price : £10/10/.

SWALES & SWANN

Technical Service, Wholesale and Manufacturers.

A. T. SWALES, Central 4773, 2 Coates Lane, Melbourne.

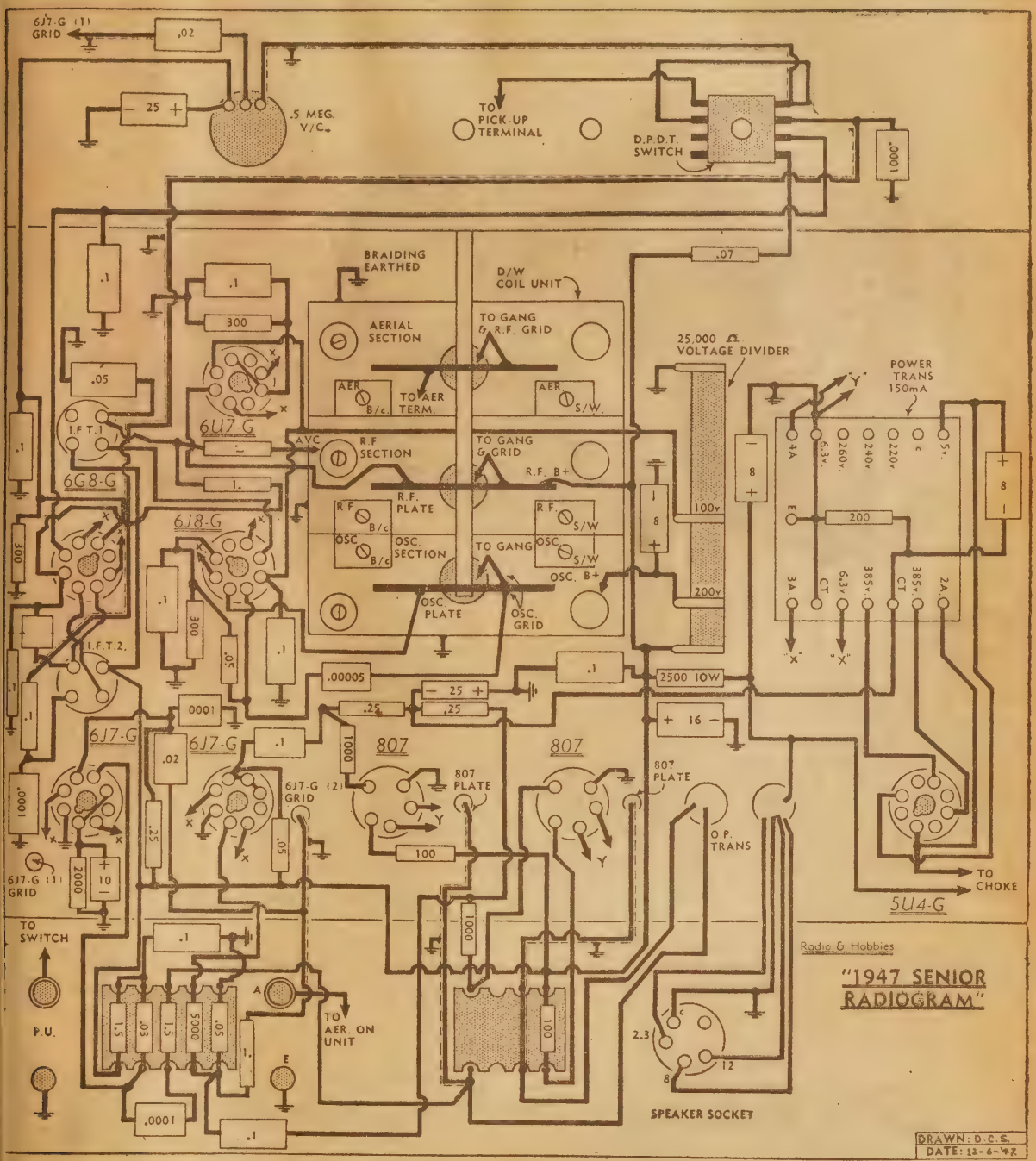
Trade Sales : Allen SWANN,

MU6895 (3 lines)

157 Elizabeth St., Melbourne.

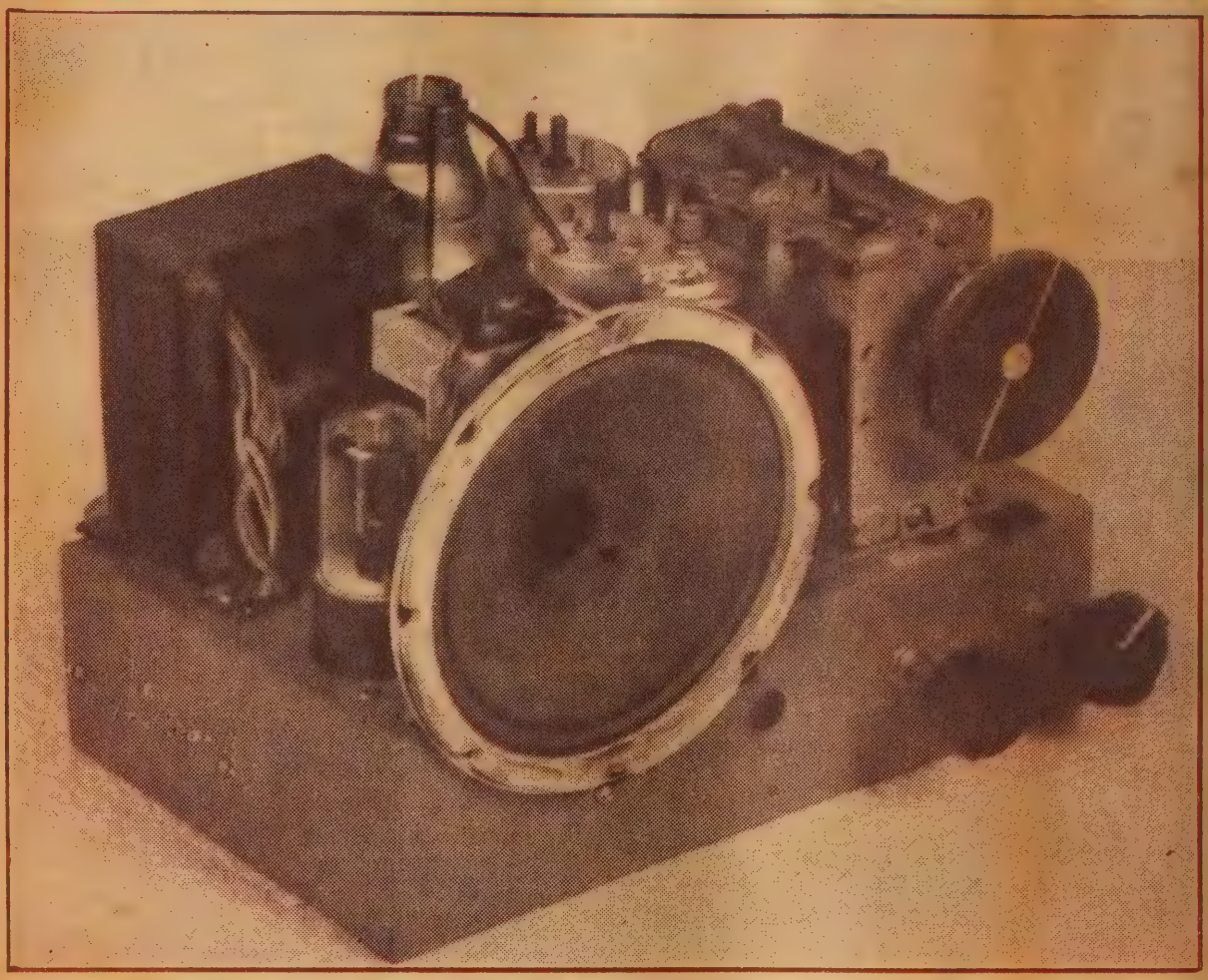
A GUARANTEE OF DEPENDABILITY

WIRING DIAGRAM FOR THE 807 RADIOGRAM



Just as we anticipated, the design of the 1947 Senior Radiogram, featured in the June issue, has created a great deal of interest around the radio trade, and we have received many requests from prospective constructors for a wiring diagram. We had this ready for inclusion in the July issue but it had to be omitted at the last moment owing to pressure on space. Here it is then, better late than never. The small parts are shown as near as possible in their correct positions, although it is naturally not feasible to draw everything exactly in place. A couple of the A.V.C. line components are included in the particular coil unit used in the original set and these therefore do not appear in the diagram. This point should be watched carefully with other type coil units, as it is essential for all A.V.C. condensers and resistors to be employed, exactly as shown in the schematic circuit. All output transformer secondary windings are returned to the loudspeaker socket. The loudspeaker plug should be wired so that the two leads from the voice coil connect across the appropriate section of the output secondary winding.

THE ORIGINAL "LITTLE GENERAL" SET



Here is the chassis ready for action! The small 6X5GT rectifier allows more ventilating space than the 80 or 5Y3G. In appearance, it is very similar to the original model.

This article describes the popular Little General in its original form but using modern valves and coils. It is still the best all-round mantel circuit considering cost, performance, and flexibility in the use of valves and components. The original chassis and cabinet were slightly smaller than those used, but as described, a dual-wave bracket can be added at any time without greatly disturbing the wiring or components.

by John Moyle VK2JU

THE Little General is probably the most successful mantel receiver ever described in Australia.

It was born in the days soon after the war, when valves and components began to get scarce. In those times, a mantel set was very much the same as any other 4/5 type, with circuits almost duplicates of the types used in larger cabinets and sold as consoles.

The circuits all conformed to the pattern of a converter, followed by an I.F. stage at 465 kc, a diode second detector, audio amplifier, pentode output valve, and rectifier. Thus five valves in all was considered to be the irreducible minimum.

One way in which such a set was reduced to four valves was to use a large diode-output valve in the last socket, supplemented by a valve such as the 6F7 as I.F. amplifier, with the triode section used as a first audio amplifier.

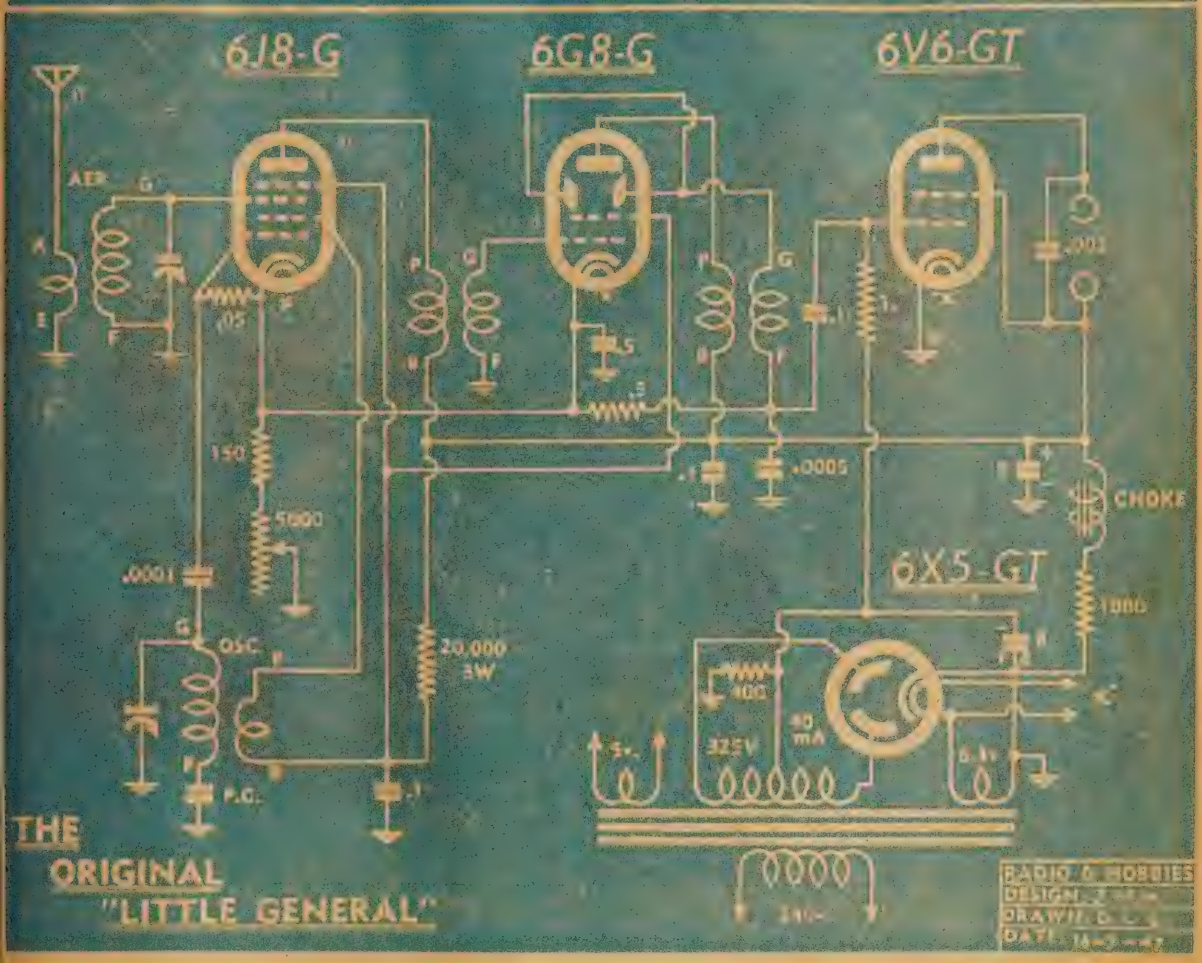
Such a set was a good performer but the scarcity of 6F7's made it an almost impossible circuit to build, at least on a large scale.

Our task was to develop a simple set, which would do all that is normally required of a mantel—to tune all the locals with good volume and selectivity, preserving, if possible, the interstate reception of which the earlier sets were capable.

The first problem—how to get the effect of a 6F7 and its dual feature but using valves which were available met with doubtful success.

You will remember we tried various

AUSTRALIA'S MOST POPULAR MANTEL



The circuit with recommended valves and values. With the 6X5GT, the 5 volt winding is not used. The filter choke and resistance are not required with an electro-dynamic speaker.

chemes, which all worked out quite vell, but which just didn't satisfy our ideas of doing a job with extreme simplicity and low cost.

It was then we hit on the very imple procedure of driving the output valve directly from the diode rectifier of a 6B8G type, the pentode section being used as the I.F. amplifier.

Everyone today knows what a practicable scheme it was. But in those days, the idea met with anything but eady acceptance among engineers in eneral. All kinds of objections were aised, some of them with good foundation.

But the idea succeeded on the fact hat most mantel sets of the past ere unable to make use of the full ain which was built into them. Their ircuits were capable of producing up o four watts or so of signal—enough o drive the largest speakers in normal use, including 12-inch types. When a small 5-inch speaker was itched up to such a combination, one ust had to reduce the volume to omething like one watt to avoid ancing the set literally off the table.

This state of affairs just didn't seem right. Why go to the trouble of building all that audio gain into the set when no one could possibly use it?

The R.F. gain was still required, if the distance-getting ability of the set was to be preserved. We didn't want to cut down on that if at all possible.

Now, by driving the output valve directly from the detector diode, all we were doing was to reduce the overall audio gain—exactly what was re-

PARTS LIST:

"LITTLE GENERAL" B/C.

- 1 Chassis, 8½ x 5½ x 1½in.
- 1 2-gang tuning condenser, no trimmers.
- 1 Midget tuning dial.
- 1 Power transformer, 325v. CT. 325v., 5v. at 2 amps., 6.3v. at 2 amps.
- 1 Small filter choke.
- 1 Aerial coil, 1 oscillator coil.
- 2 Intermediates, 465Kc.
- 1 Padder.
- 2 Trimmers.
- 1 1 meg. resistor.
- 1 .5 meg. resistor.
- 1 05 meg. resistor.
- 1 20,000 ohm. resistor, 3 watt.
- 1 1000 ohm. resistor, 5 watt.
- 1 400 ohm. resistor, W.W.
- 1 150 ohm. resistor.
- 1 5000 ohm. potentiometer.
- 2 8 mfd. electrolytic condensers, 525 P.V.
- 1 .5 mfd. tubular condenser.
- 3 .1 mfd. tubular condensers.
- 1 .002 mfd. tubular condenser.
- 1 .0001 mfd. mica condenser.
- 1 .0005 mfd. mica condenser.

SOCKETS: 3 Octal, 1 4-pin.

VALVES: 1 6J8-G, 1 6G8-G, 1 6V6-G 1 6X5-GT.

SPEAKER: 5in. permagnetic, matched to output valve, 5000 ohms.

SUNDRIES: 2 knobs, 2 terminals, hook-up wire, 2 small grid clips, nuts and bolts, power flex, &c.

1 Special cabinet.

LITTLE GENERAL—REAR VIEW

The aerial terminal is at the extreme left hand corner of the chassis.

quired. Local stations, even under these conditions, were easily able to overload the speaker The interstate stations were still there, and able to be played as loudly as one could wish, but they no longer tried to beef themselves through like the locals.

In other words, the circuit worked completely successfully.

True, inverse feedback went by the board with its levelling effect on frequency response. But in a baby set, one can't get the highest quality anyhow. There are few lows to worry about, as the cabinets just don't allow them to be reproduced, even if the speakers could handle them.

HUM LEVEL

The low audio gain reduced one of the biggest mantel bugbears—high hum level. You could run it right next to your ear, and the hum was scarcely noticeable. We really had something!

To make the set still more attractive, we simplified the circuit to the nth degree. A.V.C. was discarded in favor of a manual control—a common resistor was used to get screen and oscillator plate voltages — back-bias was employed for the output valve

Have a look at the circuit yourself and compare it with the average commercial model, particularly one built about 1940. See what I mean?

The success of the little set, together with the baby cabinet we designed for it, was instantaneous and phenomenal. What the 1933 Standard did for big sets in the old "Wireless Weekly" days, the Little General did for mantels.

After the first model appeared, we were obliged to present a dual-wave version, calling for a somewhat deeper chassis and larger cabinet. It is this chassis and cabinet which are universally obtainable today.

But, to my way of thinking, the original set had something that the more pretentious editions never achieved — utter simplicity low cost, and ease of construction, coupled with first-rate results.

Until I pulled the original set t pieces to build this one, and said regretful good-bye to the old-fashione coils and odd valves I had put into i over the years, it had been playing m music ever since it was first com pleted. I had carted it round in m bag during the war into any plac where there was AC to run it. It ha never broken down, and gave no troubl except to shed an occasional valve i the course of time.

When I finally dismantled it a coupl of weeks ago, it had a 6A7 converte 6B7 IF detector, and, of all things an old 89 I have had for years. In th interim, it has used 6J8 and 6K8 con verters, 6B8G and 6G8G as IF. and 6V6G and 6F6G audio amplifier, al with no change to any of the compon ents.

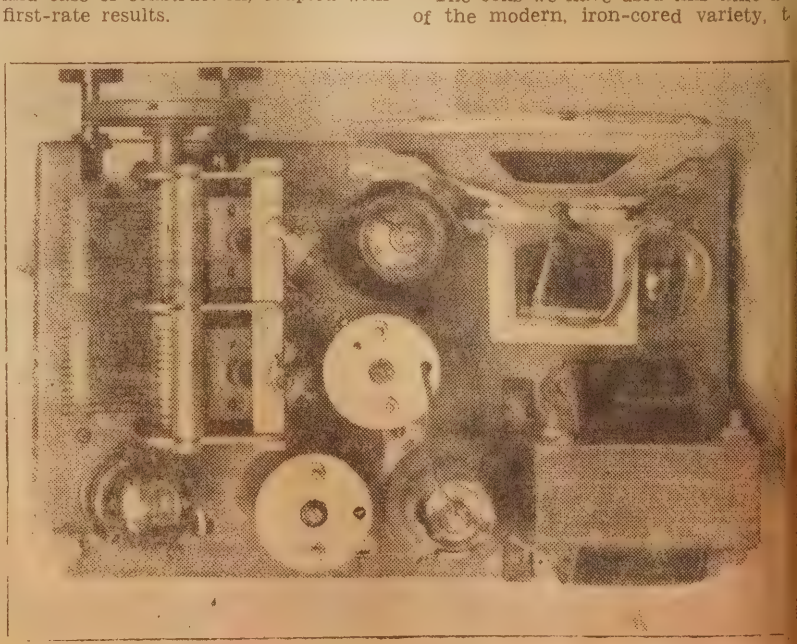
STANDARD CIRCUIT

That's the kind of set the Littl General is! It's no wonder I have a affection for it. It was the first of it kind, certainly the first to be describe using such a circuit. There have bee well over 100.000 duplicates made in th various versions, and it is now accepte in principle as the standard method o making a mantel set.

Set-building conditions today call fo some improvisation, just as they di in the 1940's. We still like to see design which use material easy to get. Tha is why we have revived the original cir cuit, with a few minor alterations t suit later developments. You will notic the use of a small choke and condense to suit permagnetic speakers. We nov use high-gain iron-cored coils whic pep up the performance. But the cir cuit is still essentially the same as i the days when the Little General mad its first bow to our readers.

Let me now consider a few point in design, and point out the variou alternative components you may use and the effect they are likely to hav on performance.

The coils we have used this time ar of the modern, iron-cored variety, t



A plan view of the set shows the speaker transformer bolted to the frame. Note the trimmers mounted on the gang.

On the beam....

with KINGSLEY radio equipment

The turret Ferrotuned K/CR/12 Communications Receiver will begin to come off the production line during the month of August. Production will be limited, and supplies to customers will be strictly in accordance with date of order.

Supplies through all Kingsley Distributors.

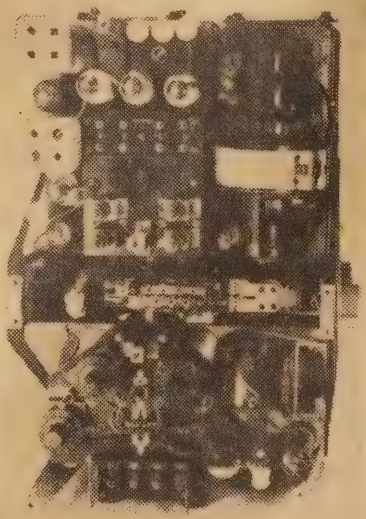
KINGSLEY QUALITY RADIO PRODUCTS

KINGSLEY RADIO

KINGSLEY RADIO PTY. LTD.

380 St. Kilda Road, Melbourne, Victoria . Phones: MX 1159, MX 3653

NEW DISPOSALS EQUIPMENT



TRANSCEIVER

Contains a 6-valve superhet receiver with crystal locked frequencies.

A 3-valve Transmitter, Crystal Controlled, tuned with 4 Silver-plated Variable Inductances.

Genemotor 24 Volts Input; 6.5 Volts, 2.5 Amps Output and 250 Volts 50 M.A. Output.

Valves used are Standard 6.3 Octal Base Types as follows: Receiver, 3 VR56, 2 VR53, 1 VR57. Transmitter: 1 VR52, 1 VT501, 1 EF50.

Weight: 33lb. Size: 14½" x 12½" x 7½".

£5/15/- F.O.R.

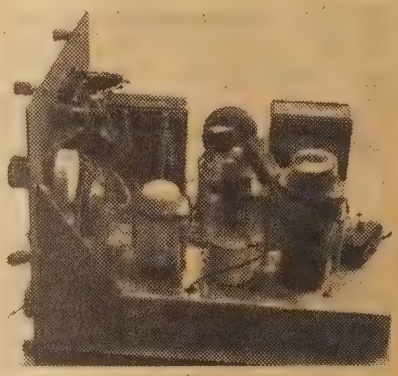
Noise Suppressor Unit

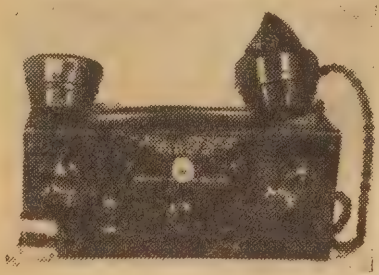
Contains many useful parts such as Resistors, Condensers, Volume Controls, Fuse Holders, Micro-Switch, Metal Rectifier, Choke, Sockets, Terminals, Etc.

This Equipment is New and includes the following Valves: 1 5Z4G Rectifier, 1 CV18 6.3 Twin Triode, RK34 Equivalent, 1 VR66 Penthode, 1 EA50 Miniature Diode.

Weight: 15lb. Size: 10" x 9" x 8½".

£2/10/- F.O.R.





WALKIE - TALKIE TRANSCEIVER

A useful little transceiver for short range work.

Receiver operates continuously from 22 M/C to 25 M/C. Transmitter operates on 3 set frequencies 22.5 M/CS, 23.5 M/CS, 24.5 M/CS.

Easily adapted to 10 metres. Complete other than batteries, valves used are 4-1C5G Penthodes, circuit diagram and instruction card supplied with each set. Batteries required, 1.5 L.T. 67½ to 90 volts H.T. Weight 10lbs. Size 12" x 12" x 4½".

£6/17/6

Postage and packing extra. N.S.W. 3/-, Interstate 4/6.

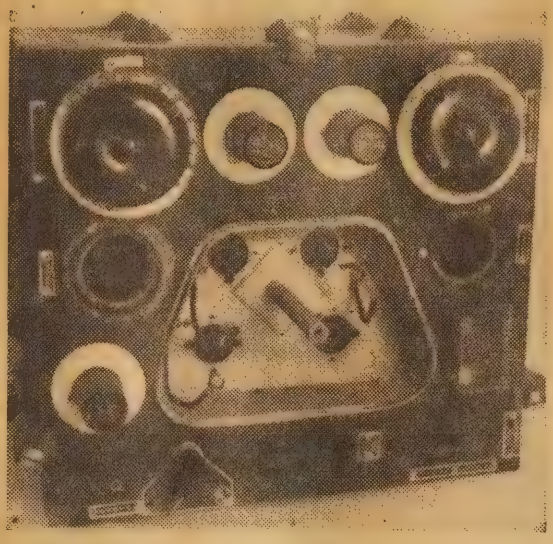
PARAGON RADIO

245 PARRAMATTA ROAD, HABERFIELD.

POSTAL ADDRESS: BOX 14 P.O. HABERFIELD, N.S.W.

PHONE UA2145.

NEW AND USED DISPOSALS EQUIPMENT



Type AR14 Receiver

ALL BAND RECEIVER LESS VALVES AND COILS*

3 sets of formers supplied for winding your own coils.

Valves required: 2 1P5, 1 1D8GT, 1 1J6. Fitted with 2 vernier dials and supplied in original carrying case.

Limited quantity of Valves available at 50/ per kit extra.

Size: 11½" x 10" x 8½". Weight packed 25lb.

£2/17/6 F.O.R.

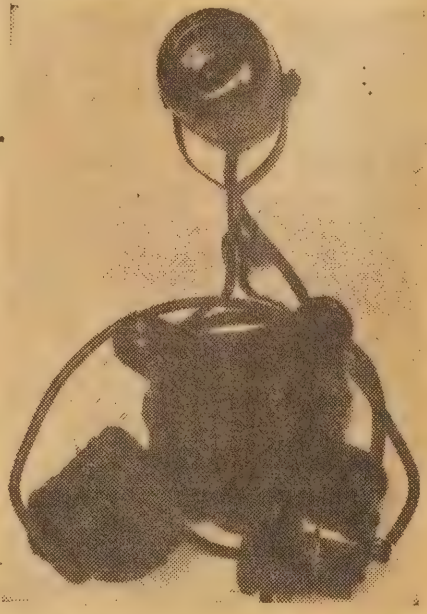
Lifeboat Transmitter

SUITABLE FOR 166/170 M/C BAND NEW IN ORIGINAL CARTONS

These transmitters operate on 176 M/Cs., but with slight modifications, details of which are supplied with each transmitter, will cover the 166/170MC. band.

Each transmitter contains 1 miniature triode valve; 1.7-foot telescopic mast with dipole antenna; battery container and switch. Batteries required: 1.5 volts L.T., 67½ to 90 volts H.T.

12/6 Postage extra, 2/-.



HEAD & BREASTSET

SOUND POWERED

NEW IN ORIGINAL CARTONS

These units make an ideal telephone for communication between house and garage, etc. No batteries are required as these units have sufficient output to operate another of these sets.

25/- each

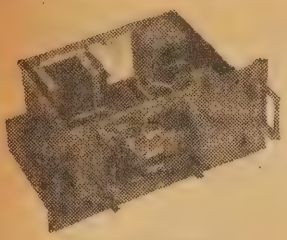
(Including Postage).

PARAGON RADIO

245 PARRAMATTA ROAD, HABERFIELD.

ADDRESS ALL MAIL TO BOX 14, P.O. HABERFIELD.

PHONE UA2145



BRAND NEW ADMIRALTY POWER PACKS

230v. A.C. input, 350v. D.C. at 200 Ma. output: **£4**

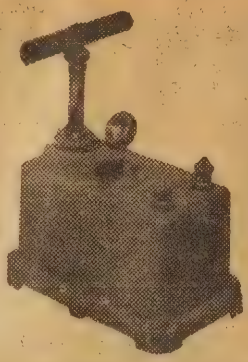
MINIATURE PHONE JACK 2/-

8 Point Post Office Jack **1/6**

R.A.A.F. HEAD-PHONES

4,000 ohms, Suitable Crystal sets

17/6 per pair



DYNAMO EXPLODER

Made by Thorne and Dean

COST **£18/-/-**

BRAND NEW **37/6**

ALMOST NEW **30/-**

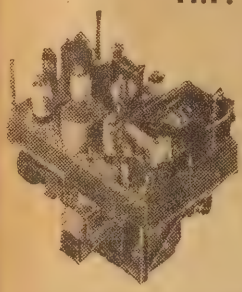
PORTABLE LIFE BOAT TRANSMITTER

Complete and brand new, with light-weight folding Telescopic Di/pole Aerial, 6ft. 6in. high, folding to 15in. You couldn't have a better portable Di/pole Aerial; 18/6 each.

PEDAL OPERATED BATTERY CHARGERS

Complete with frame, cycle seat, gears, pedals, chain and 6V charging generator. **£4/19/6**

H.F. RECEIVER



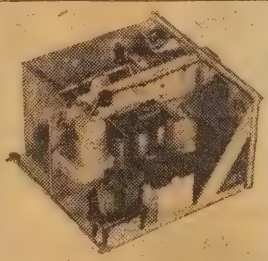
11 Valves, complete and new. Parts include Genomotor relays, Condensers, Resistors, Chokes. Would delight any amateur for rebuilding.

BRAND NEW £5. Same SLIGHTLY SECOND HAND.

£4/17/6

A.W.A. POWER VIBRATORS

6 volt, Brand New, Cost £2/10/-, 15/-. Oak Vibrators, 6 volt Syc. **NEW 12/6**

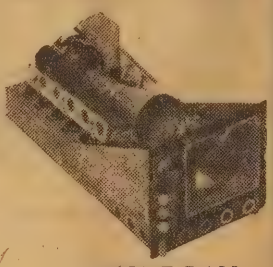


UHF TRANSMITTER

Contains Blower motor, 2 Micro-Pup tubes, Meter Condenser 2 Amp. valves, etc. **£4/18/6**

BROMIDE PAPER BARGAINS

5½" x 5½" 4/6 per ½ gross; 9" x 9" 17/6 per gross; 9" x 7½" 12/6 per gross; 20" x 24" 10 shts for 9/6.



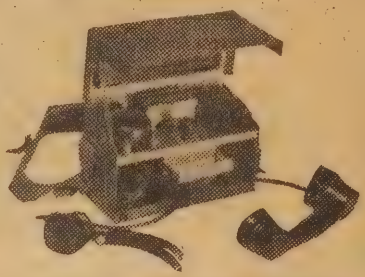
CATHODE RAY CHASSIS

Suit 905 tube or its equivalent. All controls, gain, focus and bias. Rang, horizontal and vertical. Shift and Synchroniser. **£3/-/-**

FINEST QUALITY FOLDING AERIAL

with Bakelite base

27/6 each



BRAND NEW TELEPHONE

Made by STC. Easy to instal.

Cost £12/12/- **£2/16/-**

SPOT LAMPS

Excellent for SHOOTING FISHING and HIKING

17/6 each

0/14v., 0/250v. double reading Meter. 1000 ohms per v. 14/6

Excellent carrying case for same 2/6

BARGAIN BULLETIN — **CHOCK FULL OF BARGAINS**

FILL IN AND SEND

To Waltham Trading Co. Pty. Ltd.,
393 Flinders Street,
Melbourne, C.1, Vic.

Please send me your BARGAIN BULLETIN, chock full of Radio, Electrical and Campers' bargains, post free.

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NAME .....

FULL POSTAL ADDRESS .....

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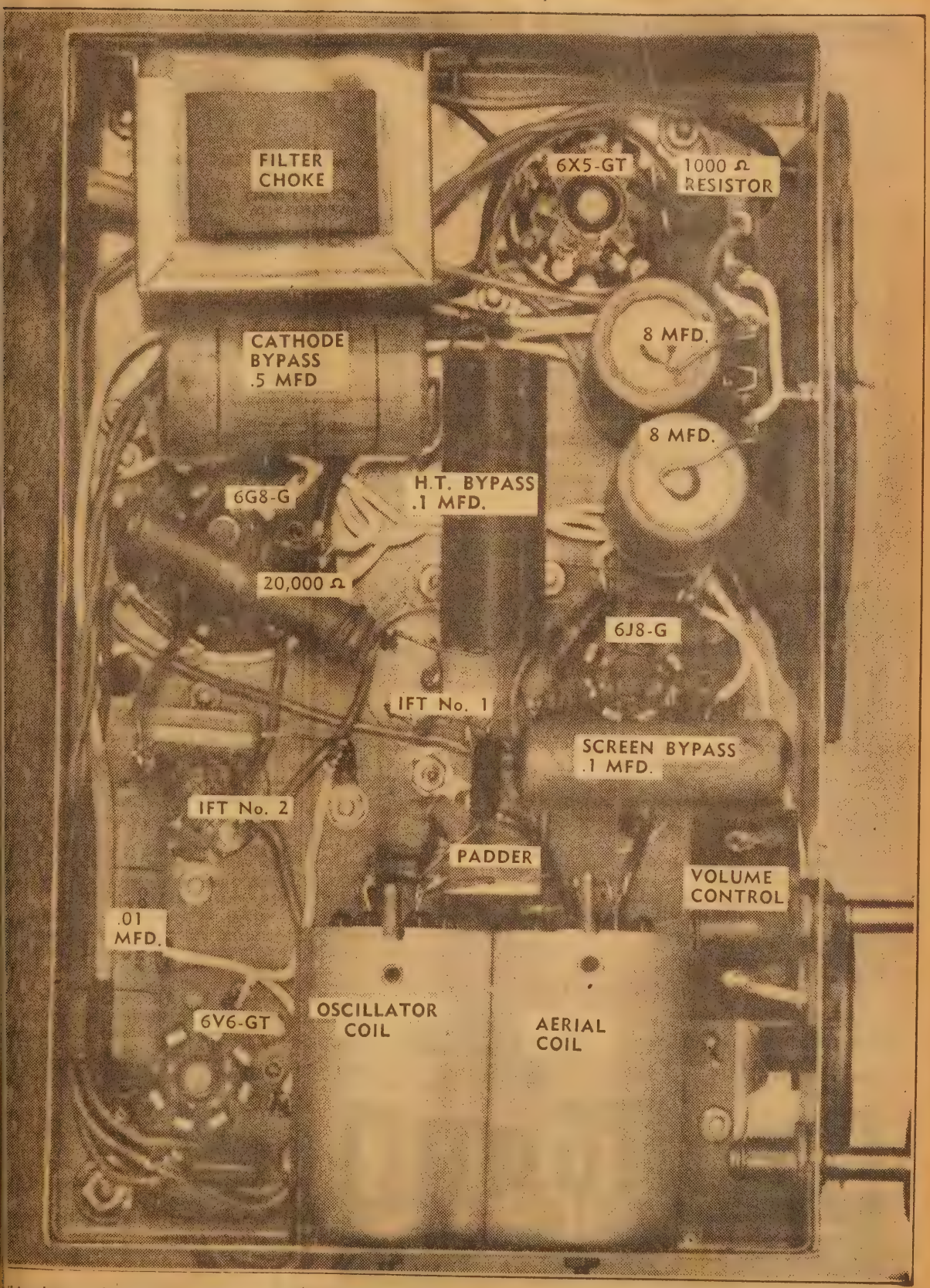
WALTHAM TRADING Co. Pty. Ltd.

393 FLINDERS STREET, MELBOURNE, C.1. **MU4719**

MAIL ORDERS CAREFULLY PACKED AND DESPATCHED.

UNDER-CHASSIS PHOTO OF LITTLE GENERAL



This photograph shows the position of all main components. Bias resistor is not marked but is in the top right hand corner.

ALL BRAND NEW AT FIXED PRICES

Guaranteed Immediate Delivery

POWER TRANSFORMERS

40 M/A	325 volt	vertical mount	19/7 each
60 M/A	385 volt	horizontal mount	21/5 "
80 M/A	385 volt	"	27/8 "
100 M/A	385 volt	" "	32/1 "
125 M/A	385 volt	" "	39/3 "
150 M/A	385 volt	" "	49/3 "
200 M/A	385 volt	" "	77/4 "

VARIABLE CONDENSERS

2 Gang H	Stromberg Carlson		17/6 each
3 " H	" "		21/- "
1 "	A.W.A.		11/9 "
2 "	A.W.A.		17/- "
3 "	A.W.A.		22/- "
2 "	Midget F.N. Mid. Cap.		19/3 "
2 Plate	Midget 10 mmf	CV34	4/- each
3 " "	15 mmf	CV35	4/3 "
4 " "	25 mmf	CV36	4/6 "
5 " "	35 mmf	CV37	4/9 "
7 " "	50 mmf	CV38	5/3 "
9 " "	70 mmf	CV39	5/10 "
14 " "	100 mmf	CV40	6/6 "

ELECTROLYTIC CONDENSERS

10 mfd	40 volt	Tubular	Pigtail	2/6 each
25 mfd	40 "	"	"	2/10 "
8 mfd	350 "	"	"	3/6 "
8 mfd	525 "	"	"	3/9 "
8 mfd	600 "	"	"	4/3 "
16 mfd	525 "	"	"	4/11 "

COILS

Q Plus Midget Oscillator Match	IR5—6A8—6SA7	4/9 each
Q Plus " Aerial	" Above	4/9 "
R.C.S. Loop Aerial		7/6 "
Miniature Loop Aerial		6/6 "
R.C.S. H Gang Aircore	Aerial	6/6 "
R.C.S. " "	Oscill.	6/6 "
R.C.S. " "	RF	6/6 "
R.C.S. " Permatune	Aerial	8/6 "
R.C.S. " "	Oscill.	8/6 "
R.C.S. " "	RF	8/6 "
Crown H Gang Permatune	Aerial	8/9 "
Crown " "	Oscill.	8/9 "
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be in line with the times. The original set, of course, used the old-style, mica trimmer types, which gave excellent results. More than once I have listened to West Australian stations on a small aerial, when conditions were good. But the new coils definitely improve overall gain, as would be expected, and should be used. At the same time, don't throw away your old coils without giving them a trial.

The only proviso is that the cans must be of the medium-sized type, in order to fit to the chassis. Large cylindrical types are definitely out.

FIXED PADDER

The modern coils will use a fixed padder of about .004 mfds., whereas the older coils use the familiar variable padder. This is about the only difference as far as construction is concerned.

The converter valve may be of any type, such as the 6A7, 6A8, 6K8, 6J8, of ECH-35, and their glass variants. You will notice that the oscillator plate and the screens are all fed through a single resistor, which should apply about 100 volts to them. It is a fact that some of the converters are rated at a higher voltage, but on the broadcast band we doubt whether you will notice any difference with the lower voltage, except, possibly on the weakest stations. Which is a very handy feature indeed.

The same flexibility applies to the IF valve, although here your choice will be limited to diode-pentode types with variable-mu characteristics. The 6B7S, 6G8G and EBF-35 are all OK, with no alterations to the circuit.

This is due in some degree to the use of a manual volume control, which avoids the possibility of oscillation on weak signals, which might occur if the same values of bias resistors were used for all types of valves in an AVC circuit.

OUTPUT VALVES

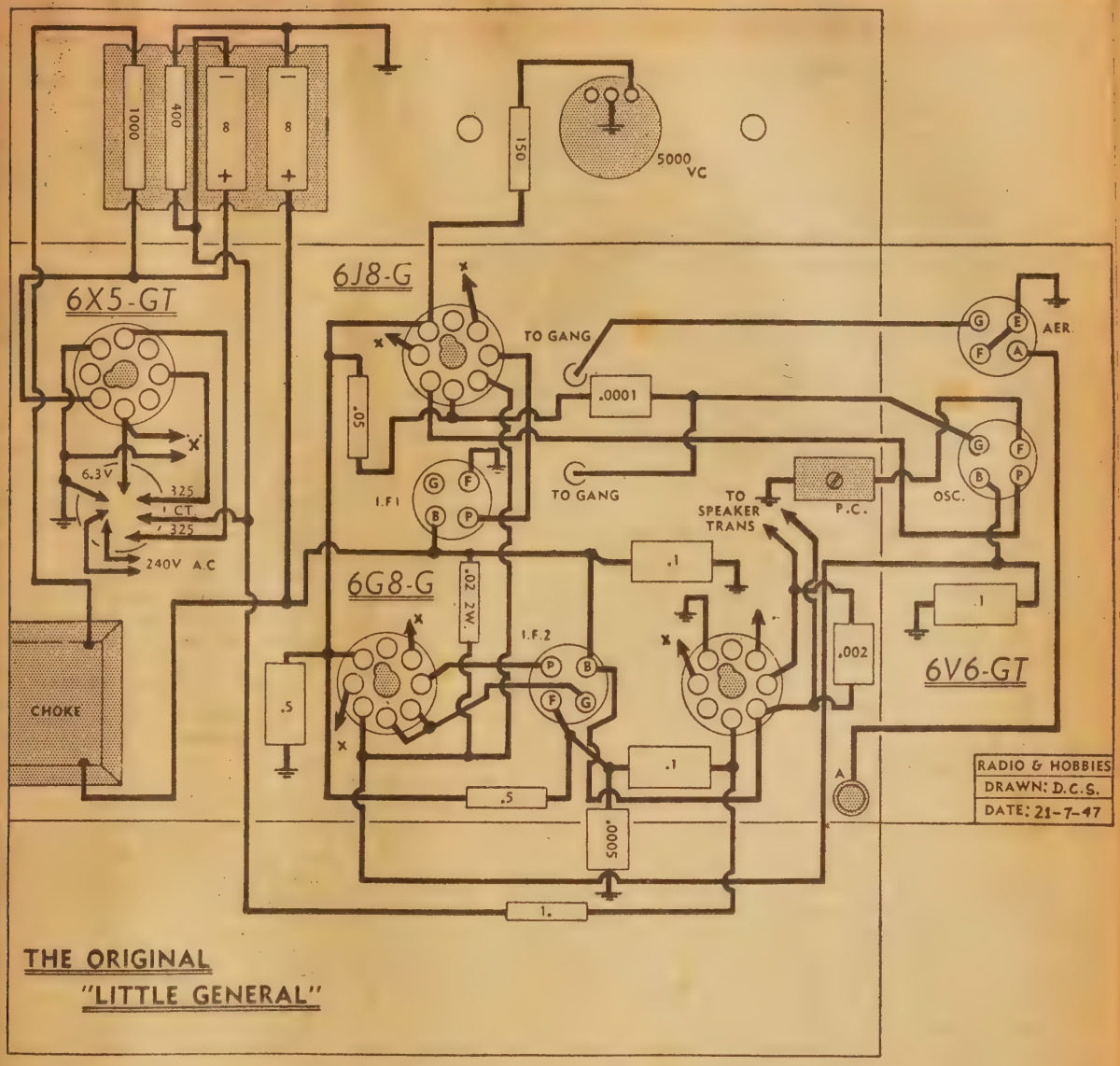
Any of the standard output pentodes such as the 6F6, 42, 6V6, &c., will be satisfactory for the output socket. You can even use some of the more unusual types, such as the 41, 89, and so on, if you have them on hand.

There is little to choose between available converters as regards performance. For the IF stage, the EBF-35 will probably give the highest gain with the greatest tendency to spill over on full sensitivity. The single ended 6FS7 is another possibility here although these valves are not yet easily obtained. The 6G8G is about the optimum type. Watch the valve socket connections if you use unusual valve types.

The 6V6 will give somewhat better sensitivity than the 6F6 and other pentodes, but there is very little to it. Then there is the EL3G, which gives most gain of all, but is somewhat large physically.

The bias resistor of 400 ohms will overbias both the 6V6 and the EL3G but the slight reduction in sensitivity which results will only reduce the maximum volume, which on locals is too great for the set's speaker and cabinet

WIRING DIAGRAM OF THE LITTLE GENERAL



As this diagram shows, the wiring up is a very simple matter.

anyhow. So that any of the valves mentioned can be used without any circuit change.

The power transformer is of the type originally produced for the Little General, and it is now considered the standard type for all mantel sets. Consideration of it ties up with the type of speaker you will use.

With a set of this type, any high-tension voltage down to about 200 and up to about 285 will give quite good results. This makes things somewhat flexible, in considering filter chokes and speaker fields.

SPEAKER FIELDS

If you use an energised speaker, with the field coil as a choke, a resistance of 1500 or 2000 ohms will suit. The higher value will give slightly less available voltage, and get somewhat warmer than the 1500 ohms, which is the recommended value.

If you use a permagnetic speaker, you will need one of the small filter chokes made for the purpose, having a resistance of about 500 ohms. The remainder of the resistance is supplied by a 5-watt 1000 ohms wire-wound resistor in series with it. It is a simple matter of substitution, and there is plenty of room under the chassis to mount the choke if it is used.

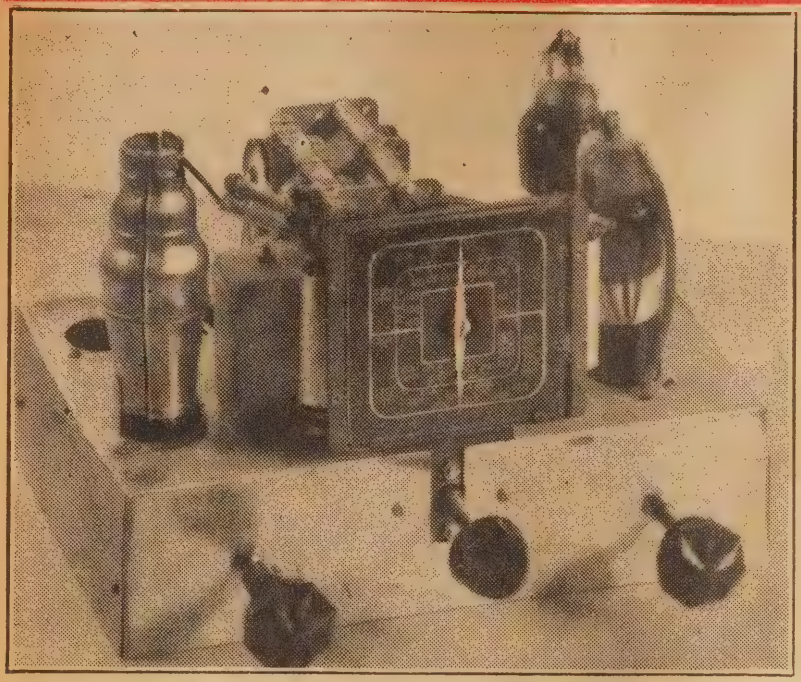
RECTIFIER

The speaker transformer, if not already mounted on the speaker itself, is bolted there as shown in the photograph. It might be packed under the chassis, but there is no need to do this, and it would make things a trifle crowded.

The rectifier can be an 80, 5V4G, 5Y3G, or 6X5GT. The indirectly heated rectifiers will give more volts than the directly heated types. Here again, the 100 ohm resistor will probably need no change, as there is quite a wide variation allowable in total high-tension, as already explained. This also applies to the voltage obtainable for the screens and oscillator plate.

Different socket connections are called for with different types of rectifiers, so just check on this point before wiring up, if you do not use the 6X5GT. This latter valve has a 6.3 volt filament, which should be wired in parallel with the filaments of the other valves. If a 5 volt rectifier is used, the 5 volt winding of the power transformer is, of course, available.

THE 1K5-G THREE VALVE RECEIVER



The set has sprung yet another valve—this time an extra audio stage which greatly improves performance.

Your 1K5 receiver is rapidly growing up. This month we describe step-by-step the addition of an audio stage which makes the audio amplifier portion of the set complete. This three valve version should be capable of giving loudspeaker reception of all the stronger stations, if used with a good aerial and earth.

IN its two-valve form the receiver has a regenerative detector which feeds into a second IK5-G valve operating as an audio power amplifier. Provided the signals passed on from the detector are strong enough to excite it fully this latter valve will operate a loudspeaker reasonably well.

However, exactly the same remarks apply as to the one-valve set. There are still likely to be signals from stations just too weak to drive the output valve properly, so that it becomes necessary to listen to them on the earphones. By adding another audio valve between the detector and output stages these weak signals can be further amplified, thus ensuring that the majority of stations are heard on the loudspeaker.

STRONGER SIGNALS

However, the extra amplification is also effective for strong signals, and these may be built up so much as to overload the output valve, apart from being too loud for comfortable listening. Because of this it becomes necessary to provide a volume control in the circuit which allows the overall gain of the amplifier to be reduced, as necessary, on the stronger stations.

The reaction control, of course, has a marked effect on volume, but it also affects the selectivity. Hence, if the reaction control is backed off too far there is a chance that stations will interfere badly with one another. Optimum results are always obtained with the reaction control advanced to near the point of oscillation and the volume control set to give the required output level.

Another point is that we suggest increasing the high tension supply voltage to 135, which will boost the power output capabilities of the set quite a deal. This change, together with the addition of an extra stage and a negative feedback circuit, will transform the performance of the set.

Let's assume, then, that you are ready to add the extra stage to your "IK5-Two."

Begin by mounting the extra valve socket in the hole just near the combined volume control and switch. Earth pin 7, which is filament minus, and connect pin 2 to the same point on the filament "off-on" switch which feeds the other filaments.

Disconnect the wire which runs from one side of the RF choke to the .02 mfd. coupling condenser in the grid circuit of the output valve. The signals from the plate circuit of the detector must now be fed to the grid of the new amplifier valve through the audio volume control.

Therefore bridge the lug on the resistor panel which already connects to the RF choke across to the lug immediately alongside it. A second .02 mfd. coupling condenser mounts between this lug and the one immediately opposite to it. Run a wire from the free end of this new coupling condenser to the farthest lug on the audio volume control.

VOLUME CONTROL

The other outside volume control lug has to be connected by a lead which runs past the resistor mounting panel and up through a hole at the rear of the chassis to the C-1.5 volt point on the bias batteries. This voltage is picked up from the wire joining the positive end of one cell to the negative end of the other.

Just to double check on the bias connections you should have two torch cells attached by a strip of aluminium

PARTS LIST

Here are the parts you already have in your two valve set:—

1 Chassis 10 x 6½ x 2½in.
1 "H" Type two-gang condenser.
1 Tuning dial, (Efco type CD/17 or similar.)
1 R.F. coil with reaction.
1 .0001 mfd. midget reaction condenser.
1 .5 meg. potentiometer with switch.
2 Octal sockets, 1 6-pin, 1 4-pin.
1 R.F. choke.
1 .1 mfd. tubular condenser.
1 .02 mfd. tubular condenser.
1 .001 mfd. mica condenser.
2 .0001 mfd. mica condensers.
1 Trimmer condenser (if not fitted to gang).
1 2 meg. resistor
1 1 meg. resistor
1 .5 meg. resistor
1 .1 meg. resistor
2 1K5-G valves.
2 45 volt "B" batteries.
1 2-volt accumulator.
2 1.5 volt torch cells.
Earphones, 2 terminals, 2 small grid clips, 6 pin battery plug, 4-pin speaker plug, 7 position resistor panel, short length shielded wire.

And you will need these extra parts:—

1 1K5-G valve.
1 Octal valve socket.
1 25 mfd. electrolytic condenser.
1 .1 mfd. tubular condenser.
1 .02 mfd. tubular condenser.
1 .0001 mfd. mica condenser.
1 1 meg. resistor.
1 .75 meg. resistor.
1 .25 meg. resistor.
1 50,000 ohm resistor.
1 45-volt "B" battery.
1 Small grid clip.

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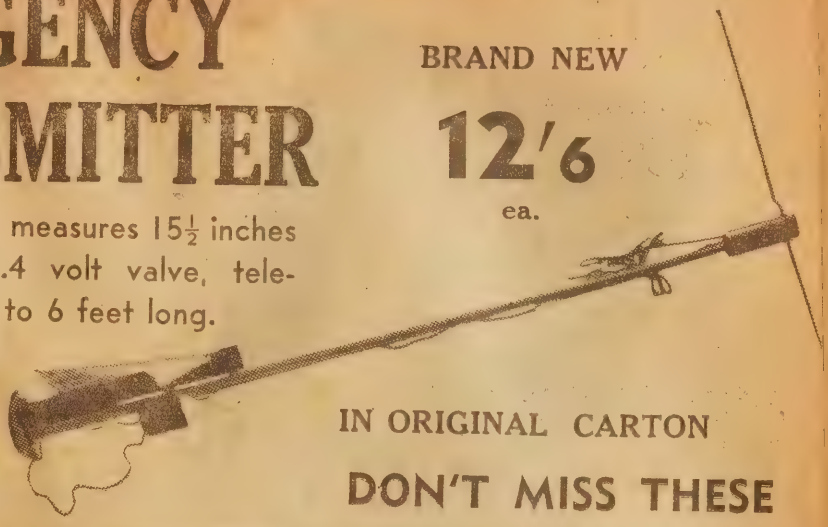

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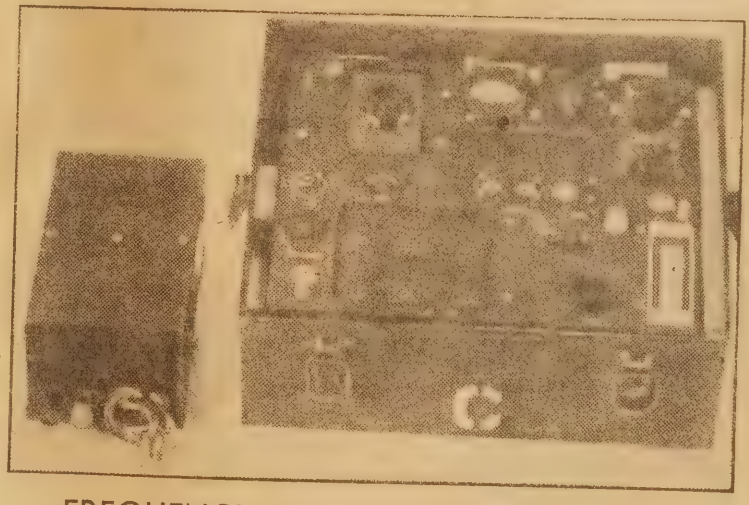

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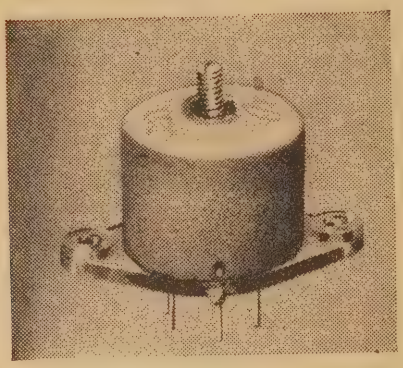

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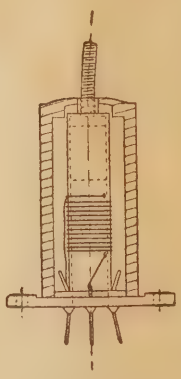

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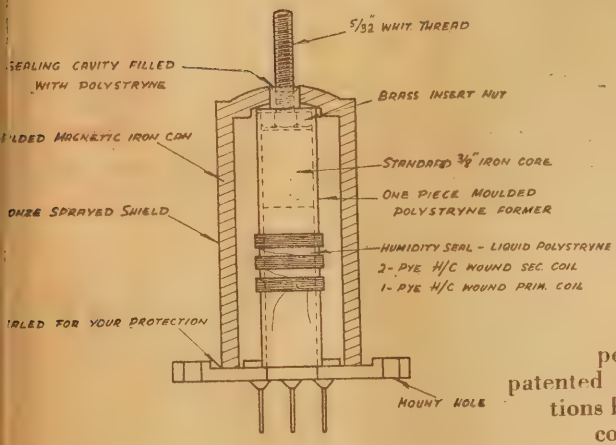
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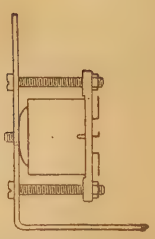
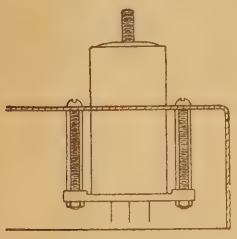
IELD FOR YOUR PROTECTION
MOUNT HOLE

This new advance in coil design offers radio technicians and set assemblers both miniature and midget coils which fulfil *all required standards of performance and stability*, yet meeting with the restricted space available in mantel, portable and personal radios. Both the miniature and midget coils are fitted with standard type base, enabling them to be fitted in lieu of standard coils. This enables manufacturers and assemblers to use these smaller coils without expensive alterations to chassis stamping dies. The secret of the magnasonic performance of this new R.C.S. development is patented Magnasonic Iron Can. The cross section illustrations below clearly show the inbuilt quality of this R.C.S. component; whilst for the further convenience of assemblers and designers, we have illustrated several methods of mounting this new coil to the chassis.

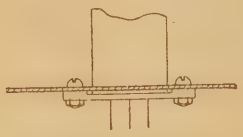
tent Number 115484.
w Coil Can.



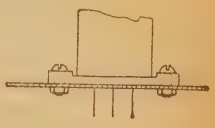
Mounted at the end of the chassis, the panel being pierced to facilitate adjustment of the iron core.



Where space is a factor the coil unit may be mounted on spacers, as shown.



The new R.C.S. unit mounted below the chassis.



Either coils may be mounted on top of the chassis in the normal manner, the mounting holes being interchangeable.

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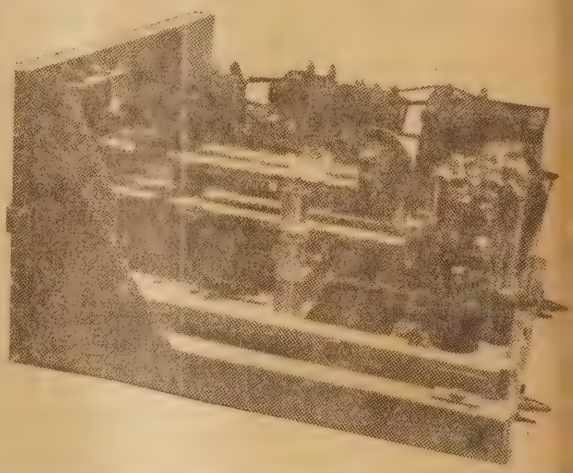

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to the chassis, just behind the gang condenser. The cells face in opposite directions and the positive centre terminal of one is connected across to the base of the other. From the point of junction, which is C-1.5, the lead runs through to the volume control, as already mentioned. The remaining positive terminal is connected to chassis and the remaining negative terminal to the output valve grid resistor.

But to get back to the job of wiring. Run a lead from the metal cover of the potentiometer to the nearest earth point on the chassis. A shielded lead must now be run from the centre lug of the potentiometer to the grid cap of the new IK5-G valve.

Cut a length of shielded wire to run from the potentiometer lug to the grid cap, and trim back the outer copper braiding by about ¾in. at each end. Then trim off about a quarter-inch of the insulation for connection into circuit. One end of the outer braiding can, if necessary, be soldered to the cover of the potentiometer, which is already earthed. But be careful to avoid accidental contact between the braid and the valve socket pins, or any other section of the wiring.

The function of the potentiometer is not difficult to understand. The signal from the detector is coupled via the coupling condenser to one end of the potentiometer element, the other end of the resistance element being at earth potential as far as the signal voltages are concerned.

OPERATION OF CONTROL

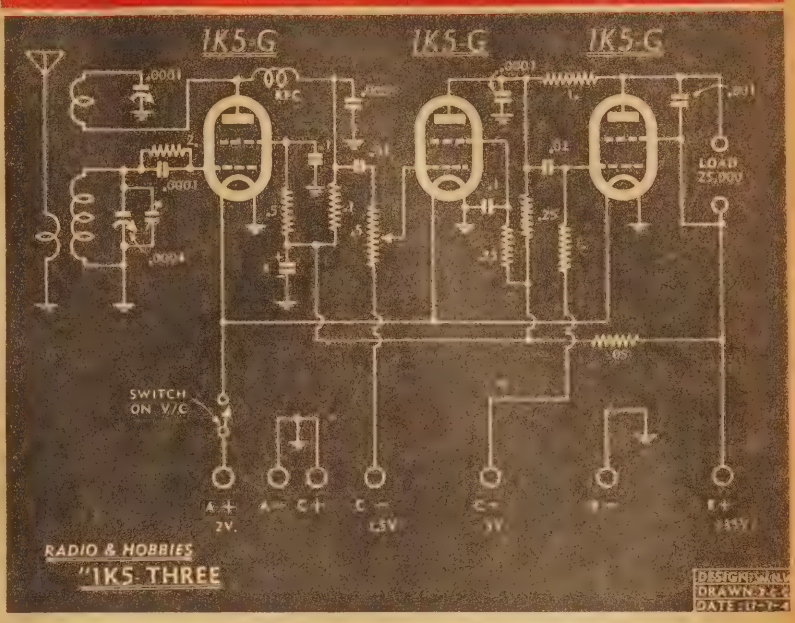
Thus, the amplitude of the signal voltage across the potentiometer gradually diminishes, being maximum at the end connected to the detector plate and zero at the end connected to the bias source. The signal voltage for the 1K5-G grid is picked off from the resistance element by the sliding contact. Depending on the setting of the potentiometer, the signal passed on to the following grid varies between the maximum value and zero.

The higher audio gain makes it necessary to take precautions against instability, and the three-valve circuit therefore provides for decoupling of the plate and screen supply to the first two valves. Therefore, disconnect the wires which now convey the high tension voltage directly to the detector plate and screen resistors.

Run a wire to link together the free ends of the two resistors and also bridge across the three adjacent lugs on the side of the resistor panel, as shown in the wiring diagram. Instal the 50,000 ohm resistor alongside the .02 mfd. coupling condenser, running a wire from the free end of it to the screen pin of the 1K5-G output valve.

Alongside that goes the 0.25 meg. resistor, a wire running from its free end to the second 1K5-G. From this same point on the resistor panel, a 1.0 meg. resistor swings across to the plate pin of the output valve and another lead is taken to the next lug but one on the resistor panel. This forms one connection to the .02 mfd. coupling condenser, which is already in place, and which feeds the signal through to the grid of the output valve.

THE IK5-G THREE CIRCUIT



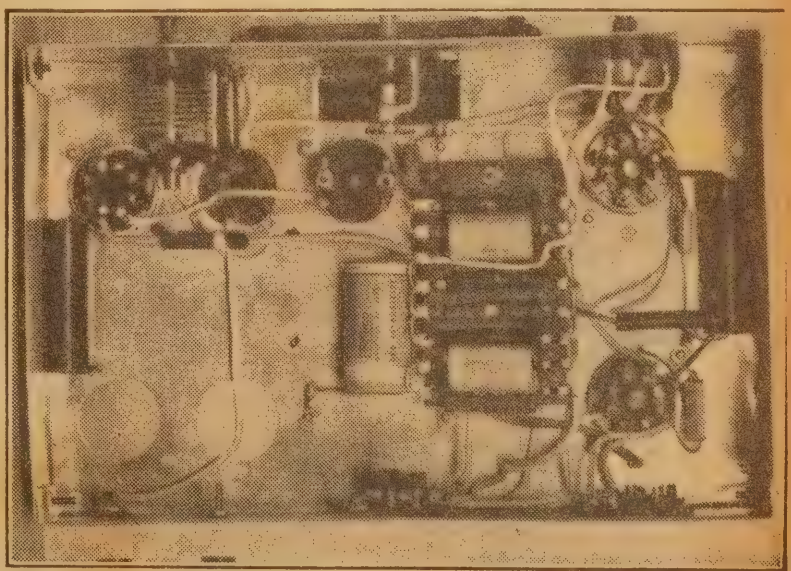
The circuit shows how the extra audio stage is added.

The plate circuit wiring of the second 1K5-G valve is completed by the addition of a .0001 mfd. mica bypass condenser between the plate pin on the socket and an earthed lug underneath one mounting screw of the output valve socket.

The screen of the second 1K5-G is provided for by a 0.75 meg. resistor, which is mounted alongside the 0.25 meg. plate resistor and connected by a short lead to the screen pin. The 0.1 mfd. screen bypass condenser is mounted directly between the screen pin of the valve and the earthed solder lug just mentioned.

The final operation is to wire in the 8 mfd. decoupling condenser between the end of the .05 meg. feed resistor and the chassis, taking care to con nect the positive end to the resisto The function of this network is t prevent variations in the output plat current, which have an effect on th supply voltage, from affecting th earlier stages. It is quite possible fc this feedback effect in the high tensio supply to promote instability in th receiver in the form of actual howlin or motor-boating. This is especiall likely to occur when the B-batterie begin to run down and develop a hig internal resistance.

One other point about the electrica circuit warrants special mentior namely the 1.0 meg. feedback resisto between the plates of the last tw valves.



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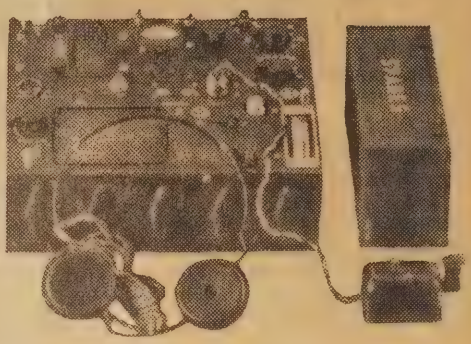

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30.0 Mfds—500v. W -- -- -- -- 20/-
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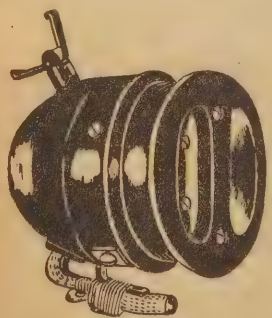

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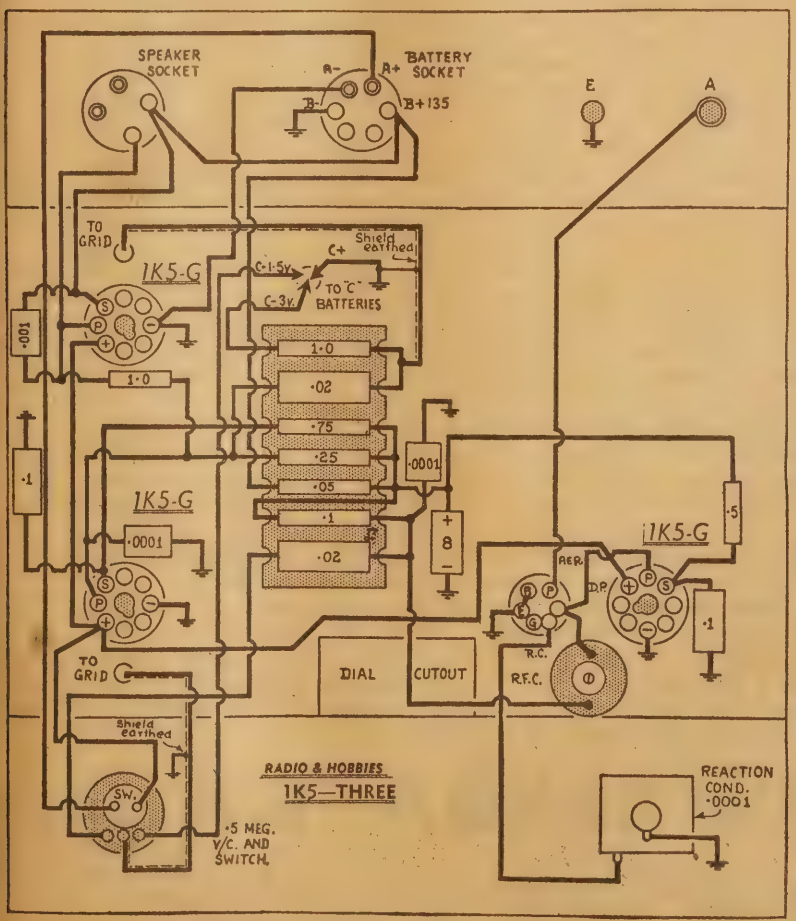
ANOTHER VIEW OF THE RECEIVER

Another view of the three-valver.

With the three 1K5-G valves all going "full bore," the audio gain is actually higher than comfortable for optimum design, and is likely to give trouble with instability or noise if everything is not just right. The addition of the 1.0 meg. feedback resistor

(Continued on Page 95)



The 1K5-G Three wiring diagram.

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U.S.A.-Magneto Call, Leather Case, 80/-; Ex-Disposals, Don V Buzzer Call, Metal Case, 50/-.

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All above types are suitable to connect to P.M.G. Lines, Party lines, Inter-office, factory, stores, etc.

SWITCHBOARDS FOR ABOVE

All types of switchboards made to order, Buzzer, Bell and Lamp Indicator types priced from £3 to £6, let us have your requirements for any Phones or sw. boards and we will be glad to quote you by return mail . . . Full range of all spares carried for above equipment . . .

Special Clearance Of Disposal Equipment

We have made up a Parcel of following goods suitable FOR EXPERIMENTERS, HOBBYISTS, SET BUILDERS, etc.

- Approx. 2 dozen Assorted Resistors, and Fixed Condensers.
- 1 only Hand Microphone, complete with cord and plug.
- 1 only Relay Panel complete. Rect. Jacks, Relay.
- 1 only Transformer, many uses.
- Small quantity Terminals, Nuts and Bolts, etc.

Price 10/- (The Lot)

MOTORS

Limited quantity of Exploder Motors converted to 240-volts A.C. at 55/-, few other fractional H.P. Motors from 1/25 h.p. to 1/8 h.p. all variable speed, priced from £3/10/-. Forward particulars of size and requirements.

CRYSTAL SETS

Complete Kit of Parts, including Headphones, Circuit Diagram and Instructions ready to assemble, 57/6.

NOTE: Cash with all orders. WE DO NOT SEND C.O.D., please add postage.

An Open Letter to the Experimenter

These few paragraphs are designed to help you get more for your money, and to achieve better results from your hobby. If these two subjects interest you, read on.

As you know, we do a large business by Mail Order, therefore you can understand our interest in an article in the May "Shopkeepers' Digest" under the title: "FIVE FACTORS IN HANDLING MAIL ORDER". Summarised, the requirements of a successful Mail Order department are the following:—

1. **Confidence between customer and store.**
2. **Absolute accuracy at every stage.**
3. **Knowledge of customers.**
4. **Knowledge of stocks.**
5. **Speed and efficiency in handling transactions.**

We were interested, because we have found by experience the importance of these five factors in meeting the exacting requirements of a big list of customers who know what they want.

Dealing individually with these requirements:—

1. **CONFIDENCE.** We believe that **all** our Mail Order customers have confidence in us. In fact, we have had some rather nice letters from many of you, saying how pleased you are with our accuracy and prompt service.

2. **ACCURACY.** We do Mail Order buying ourselves from England and the U.S.A., which accounts for some of the exclusive stocks we hold, and we know how disappointing it is to wait expectantly for goods, only to find, when they arrive, that there is some error. We put ourselves in our customer's position, and act accordingly. Most of our staff have many years experience as Radio Technicians and Engineers, and in the Radio Parts Trade. This enables us to fill our customers' orders accurately.

3. **KNOWLEDGE OF CUSTOMERS.** We keep a complete card index of all the correspondence and orders from our Mail customers, and from this we get to know what interests you most. This helps us greatly in correctly filling your orders.

4. **KNOWLEDGE OF STOCKS.** There are over *two thousand five hundred* radio and electrical items listed on our regular stock-list, as well as many odd and unusual parts not listed. Naturally our men have to, and do, know these stocks, and by reason of the large variety we have, it is in almost every case possible to fill any order without delay. As you know, there are still shortages in many parts, but it is indeed rarely that we are compelled to disappoint a Mail Order customer.

5. **SPEED AND EFFICIENCY.** We know that once you have made up your mind, and have sent your order, you are on "pins and needles" until the entire list arrives. We claim to have the "FASTEST MAIL ORDER SERVICE IN THE COMMONWEALTH" and we feel this claim is justified. With all the thousands of orders we have despatched, we have had only one complaint about our speed; by error, we sent a parcel to Papua by Surface Mail, instead of by Air Mail as requested. However, our customer has forgiven us. We always send by fastest route, except where transport charges are likely to be excessive.

A few other points about handling Mail Orders, which are not in the article mentioned earlier, have come to us in the course of long experience.

DEPENDABILITY. We have not yet experienced a single loss in transit of any of the thousands of parcels we have sent. We have found that proper packing is absolutely necessary to prevent damage in transit, and we take great care in packing and checking the goods, both for quantity and quality, before despatch. We have found that sometimes the customer has accidently ordered the wrong part, and for this reason we have a liberal exchange policy.

Because we have a pretty good team of technicians, your order is filled intelligently. In these days of shortages, we can in most cases immediately suggest a satisfactory alternative for some unobtainable part. We have the "know-how" which comes only from many years of experience. You can order from us by MAIL ORDER with absolute CONFIDENCE.

So you see that we are equipped to give you better value for your money, and to help you achieve better results from your hobby. If you are not already a customer, why not try us with your next order; if you are already a customer, there is something more you can do for us: recommend our service to all your friends. This is mutually beneficial, because the more our business increases, the faster and better will become our service to you, and to them.

Our technicians are available to lend you any help you may need in regard to radio problems. They also prepare "Colrad Technical Notes" which deal with various radio fundamentals and problems in a practical way, with a minimum of mathematics, so why not write in and put your name on our FREE MAILING LIST for "COLRAD TECHNICAL NOTES."

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The Tube with many uses.

TYPE 807 Insulated GRID CLIPS 1/9 EA.
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Expertly made, Midget Dimensions, Trimmers Fitted.

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Chassis, Panel, Brackets, etc.

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as featured R. & H., Page 20, May.

"WEARITE" Type M400B Midget
455 K'c. I.F. X'FORMERS 14/3 EA.

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For Test Leads, etc.

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40 mA., 210/210	each 27/-
40 mA., 280/280	each 24/6
60 mA., 385/385	each 25/8
60 mA., 295/295	each 25/-
80 mA., 385/385	each 29/8
80 mA., 300/300	each 28/2
100 mA., 385/385	each 35/-
100 mA., 300/300	each 32/-
150 mA., 400/400	each 52/6
250 mA., 500/500	each 85/-
Special! PT177, 60 mA.	each 21/9

FILTER CHOKES—

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80 mA., 500 Ohm	each 26/-
120 mA., 300 Ohm	each 28/-
175 mA., 100 Ohms.	each 30/-
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BAKELITE COIL FORMER

Diam.	Per In.	Per Ft.
3/16	1d.	1/-
3/8	1d.	1/-
7/16	1d.	1/-
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5/8	1½d.	1/3
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1	1½d.	1/3
1-1/8	1½d.	1/3
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Spin Tites, 5/32" size	6/-
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Large Stocks at list prices

1A4P	2A6	6G8G
1A5G	2B7	6H6
1A6G	5R4GY	6H6GT
1B4G	5W4	6J5GT
1B5G	5V4G	6K5G
1B7G	5Y3GT	6K6GT
1C4G	5Y4G	6K7GT
1C6G	5Z3	6K8G
1C7G	5Z4	6L7
1D5GP	6A4	6L7G
1D7G	6A6	6N7GT
1E5GP	6A7	6R7GT
1E7G	6A8	6SA7
1F5G	6A8G	6SC7
1G6G	6B6G	6SF5
1H4G	6B7S	6SK7
1H6G	6B8G	6SQ7
1J6G	6C6G	6T7G
1K4G	6C7G	6U5
1K5G	6C8G	6U7G
1K6G	6D6G	6X5GT
1K7G	6D8G	6V6GT
1L5G	6E5	6Y6G
1M5G	6F5G	6Z7G
2A3	6F6G	5OL6GT

Let us know your requirements. All valves tested before despatch and packed safely.

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Accuracy ± .02% (As illustrated)

80 Metre AT Cut, Mounted	£2/12/6
40 Metre BT Cut, Mounted	£2/12/6
20 Metre, Zero Drift, Mounted	£5/-/-
465 K'cs X'tal Gate, Mounted	£3/12/6
100 K'cs X'tal Gate, Mounted	£5/-/-
1000 K'cs X'tal Gate, Mounted	£5/-/-
Crystal Regrinds	20/- ea.

Customers must take risk of breakage, every care taken, and this seldom happens.

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Use the FERGUSON OP-3 Output Transformer for your 1947 Senior Radiogram (R & H June, 1947). And, for the Vibragram Seven FERGUSON'S RADIO manufacture the special 200 volt 30MA Vibrator Transformer—Type 6/200/30.

STANDARD RANGE TYPES

TYPE	PRIMARY	SECONDARY	RATING
OP-1	5000 ohms & 2500 ohms S.E.	12.5 ohms tap 8 ohms & 2.3 V.C.	10W
OP-1A	5000 ohms & 2500 ohms S.E.	500 ohm Line	10W
OP-2	5000 ohms P-P	12.5 ohms tap, 8 ohms tpd., 2.3 ohms V.C.	15W
OP-3	6600 ohms P-P	" " " "	15W
OP-4	10,000 ohms P-P	" " " "	15W
OP-5	5000, 6600, 10,000 ohms P-P	" " " "	15W
OP-6	5000 ohms P-P	500 ohms 250 ohms 125 ohms	15W
OP-7	6600 ohms P-P	" " "	15W
OP-8	10,000 ohms P-P	" " "	15W
OP-9	5000, 6600 10,000 ohms P-P	" " "	15W
OP-10	5000 ohms P-P	" " "	25W
OP-11	6600 ohms P-P	" " "	25W
OP-12	10,000 ohms P-P	" " "	25W
OP-13	5000, 6600, 10,000 ohms P-P	" " "	25W
OP-14	5000 ohms P-P	" " "	32W
OP-15	6600 ohms P-P	" " "	32W
OP-16	10,000 ohms P-P	" " "	32W
OP-17	5000, 6600,10,000 ohms P-P	" " "	32W
OP-18	3800 ohms P-P	" " "	60W
OP-19A	5000 ohms P-P	12.5 ohms tpd., 8 ohms tpd. 2.3 ohms V.C. Hi-Fi	15W
OP-19B	5000 ohms P-P	500 ohms, 250 ohms, 125 ohms, Hi-Fi	15W
OP-20	11,600 ohms, 8400 ohms P-P	500, 250, 166, 125 ohms	150W
OP-21	8000 ohms P-P	500, 250, 125 ohms	15W
OP-8M	10,000 ohms P-P	500 ohm line 10 tappings	15W
OP-15M	6600 ohms P-P	" " " "	32W
IP-1	6J7G triode	CLASS A1, AB1 grid driver	
IP-2	6V6G "	CLASS AB2 grid driver 807 etc.	
IP-3	(45's P-P A or AB1) (2A3's P-P A or AB1)	CLASS B DRIVER 800, 808, 809, 830B, etc.	
FOR TEST LOUDSPEAKERS		PRIM ——RATIO -- -- -- 2, 3, or 4 ½ sec.	10W
U1	30,000 ohms, 20,000 ohms, 14,000 ohms 10,000 ohms, 7,000 ohms, 5,000 ohms 2,500 ohms P-P or S.E.	2.3 ohms	10W
MODULATION TRANSFORMER M—50	3,800 ohms, 6,600 ohms, 8,000 ohms P-P	10,000 ohms, 7500 ohms 6500 ohms, 5500 ohms 4500 ohms, 3500 ohms	50W

VIBRATOR TRANSFORMERS

6V/150	6V 0.9A	150 -- -- -- 25MA
6V/200	6V 2.9A	200 -- -- -- 50MA
6V/250	6V 3.4A	250 -- -- -- 60MA

Procurable from any wholesale house in all States including Tasmania. If you have any trouble obtaining supplies write to us direct and we will forward a list of suppliers.

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WE SPECIALISE IN THE REQUIREMENTS OF AMPLIFIER MANUFACTURERS

FROM THE SERVICEMAN WHO TELLS

One does not usually credit a radio receiver with psychic powers, but a couple of incidents recently might give one that impression. These have been far more subtle than the usual story of a receiver breaking down just when the owner wanted to hear the final, stupendous instalment of some soul-shattering human drama.

THE first incident is related in a letter which the Editor passed on to me from a reader in Maryborough, Queensland. This reader's set showed an apparent aversion to family ablutions, in that it emitted a noise like thunderstorm static each time the bath-heater was operated in the noble cause of cleanliness.

If the bath-heater had been of the electric type there would have been little to wonder at. Electric bath-heaters draw a lot of current and will cause severe sparking at any poor connections in the wiring or in the switch and fuse arrangements. The elements, too, could cause trouble in this respect. However, this was not an electric job at all, but a chip bath-heater. And, as far as I know, wood chips are never a threat to radio reception at any stage in their career. The correspondent ended his letter on the rather cheerful note that the receiver was built to a "Radio and Hobbies" design.

A T.R.F. RECEIVER

The second receiver was one I came across personally in the normal course of my activities. This one was not a "Radio and Hobbies" design, being a rather old style T.R.F. set, using a couple of R.F. stages, plate detector and triode driver, transformers coupled to a pair of 45 output valves. The speaker is of early American pattern, with paper cone and chamois leather surround.

I may mention in passing that this is a particularly pleasant set to listen to at normal room volume. The T.R.F. tuner has only just enough gain and selectivity to tune the local stations and therefore does not lop off much of the treble register. The bass response lacks the boom of many more modern sets and the net result is a very clean and nicely balanced response.

However, that is rather by the way. The particular complaint about this set was that it showed an apparent intuitive concern for the digestive well-being of the family. As sure as the lady of the house cooked a baked dinner or a cake, the set would refuse to play at its accustomed volume. This time it was a gas stove.

Naturally enough, the lady of the house was intrigued by the rather uncomplimentary effect, but I hastened to demonstrate that the same result could be achieved by pressing against the oven flue pipe leading up through the skillion roof.

The reader from Queensland cured his trouble by bending the supporting lugs of the inner flue pipe so that it was a tight fit inside the outer pipe.

The story in both cases was, of course, that the iron roof of the house was being earthed intermittently by the flue pipes which made a connection between the roofing iron, through the installation, to the water or gas mains. And an earthed iron roof tends to shield an indoor aerial wire from the incoming radio waves.

ROOF EARTHING

I don't know what the custom of established builders is in regard to the earthing or otherwise of iron roofs, but it is fairly certain that many iron roofs go on with no thought to this point. Without seeking to enter the realm of local government building codes—if they apply—it is clear from a radio point of view that a metal roof should either be deliberately earthed or deliberately insulated. If not, there is good opportunity for the various creations of the plumbers' art to make intermittent contact and have the effects related.

So, if you have any suspicion that your receiver is giving trouble of this nature, there are three courses open to you: (1) Remove the iron roof, strengthen the timber structure and replace it with a tiled roof. (2) Either earth or insulate roof from ground in a positive fashion; or (3) instal an outside aerial so that the signal pickup will not be affected by the idiosyncrasies of your roof. I might mention that the latter course represents the most economical approach to the problem.

Most servicemen groan inwardly when a client complains that their receiver suffers from any intermittent fault. If there is an honest-to-goodness breakdown, one can go right ahead and locate the trouble by approved methods. A check over the circuit with a multimeter or a signal tracer seldom fails to yield immediate results.

But, in the case of intermittent trouble, it is as often as not completely absent when the serviceman calls and one is rather in the position of a bloodhound, complete with fugitive and police, but without a scent. In a case like this, I usually wait around for a few minutes to give the receiver a chance to play up before anything is disturbed.

The time can be occupied usefully by checking on the power switch and plug and other electrical fittings in the house. Occasionally the trouble is simply due to a poor electrical contact in a light switch or lamp socket. Most frequent offenders in this regard are the old-fashioned brass switches and the grub screws in any of the usual fittings. The constant movements in a switch can loosen the screws and set up a miniature arc with tragic results to radio reception.

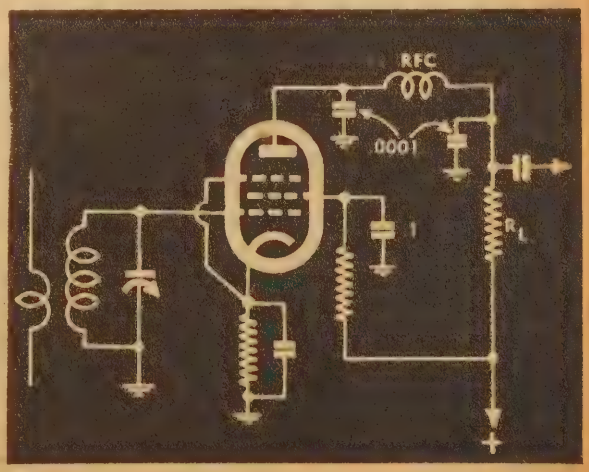
However, even if a faulty fitting is discovered, it is not safe to assume off hand that it is the cause of the trouble. Questioning may reveal that the set gives trouble during daytime, when the light would not be switched on. But attention to such faults may avoid the suggestion later that you have not fixed the set, anyway.

FAULTS—AND FAULTS!

From the serviceman's point of view it is often better if there is something radically wrong with the receiver. If some simple adjustment is all that is necessary to rectify a fault, some set owners are unfortunately inclined to take the view that they could have fixed it themselves and that a service charge under the circumstances is therefore unjustified.

Precisely the same reasoning could apply to the medico who visits a patient and prescribes a patent medicine which any member of the household could have bought. And if the medico can rightfully accept a fee for feeling a pulse, so should a serviceman be paid for spending equivalent time and energy attending to some minor ailment in a radio receiver.

But to get back to the point. If the set does make the noise com-



Showing the RF choke which caused all the trouble.

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Midget 2 Gang Condenser
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Announcing the release of our
NEW SINGLE GANG MIDGET CONDENSER
1 7/8" x 7/8" x ½"

The smallest, single gang broadcast condenser ever made! **Now 12/6 each.**

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47/6

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(Ideal for amplifiers, etc.)

65/-

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1/6 per pair

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100 watt.
200kc-500kc, 2mc-5mc 5mc-10mc.
Preset tuning to any range, complete with tubes, "Weston" meters, charts etc, only £35/0/0

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TX'S "MARCONI" TX'S
150 Watt
3 stage P/Pull output up to 16Mc. Master Osc, VFO, all meters, calibration charts etc. Lo-Hi aerial tuning unit included, built in Modulator £25/0/0

ONE ONLY. Brand New. Laboratory Sub-standard "MARCONI" Wavemeter, 7kc-25mc. Built in IMC Xstal Temp oven with Therm control.
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A large assortment of Racks, floor or wall mounting type etc. prices available on application. Suitable for TX's, Amplifers etc.

Boxes of assorted parts, including ½, 1, and up to 120 watt resistors, block and tubular condensers, of popular sizes electrolytic cond's etc, worth 50/- SPECIAL PRICE 20/-.

50,000 ohm 120 watt WW resist. 7/-
1000 ohm 120 watt WW resistor 7/-
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24,000 tapped at 11,000 WW 4/-
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10 watt WW resistors in sizes 300, 1500, 5000 etc. ceramic 2/6

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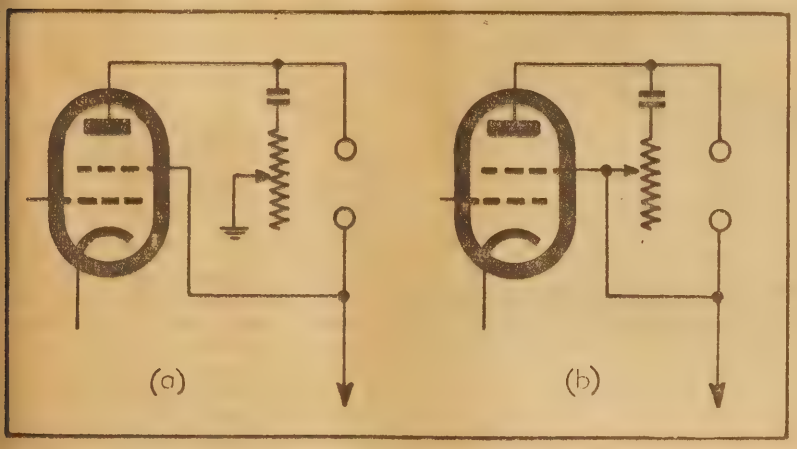
Radio and Electronic Engineers,

265 Military Road, Cremorne, N.S.W.
XM7063

plained of, quick action is called for. The aerial terminal is first shorted out, then the grid cap of the first valve, and so on through the set stage by stage. With a spot of luck one can pick the section of the receiver in which the noise is occurring. Thus, if it is still audible with the first audio grid shorted to earth, the noise must obviously be in the audio section of the receiver.

Failing "co-operation" on the part of the set, it can be removed from the cabinet, if time permits, for a preliminary examination. Sometimes slight movement of one of the valves in its socket or pressure on part of the wiring will produce the noise and simplify location of the trouble. Failing that, there is usually nothing for it but to take the receiver back to the service shop and let it run on the test bench until the trouble decides to show up of its own accord.



Connections at (b) imposes much less voltage strain than (a) on condenser.

The last receiver I had to handle with intermittent noise was a superhet of about 1933 vintage, with 2.5 volt valves and an anode-bend detector. The noise was described to me as a scratching noise, which persisted on all stations and happened at any odd time of the day. Occasionally the set would run quite satisfactorily for hours on end. It refused to exhibit the effect while I was in the home, and there was no suggestion of poor electrical fittings or of loose valves or wiring in the receiver.

THAT "SCRATCH"

Consequently, I loaded the chassis and speaker in the car and took them back for a test run on the service bench. About an hour after switching on, a definite scratching noise became apparent and a rapid check identified it with the audio end of the set.

One of the things I immediately suspected was a faulty output transformer, so that the set was connected to the test loudspeaker. It seemed OK after the change, but never be misled by such a circumstance. The very act of switching off and on can have a temporary effect on an intermittent fault.

After another hour, just when I was beginning to blame the loudspeaker after all, the scratching noise reappeared, and I was on to the chassis quick and lively. Shorting the detector grid did not stop the noise and shorting the screen had only a secondary effect. But the moment I touched the plate, the noise disappeared immediately.

Fortunately it reappeared a moment later and saved a further long delay. Because I had had the experience before, I shorted out the RF choke and obtained welcome silence. Removing the short introduced the trouble again, so that I had found the cause of it all. It was a simple matter to replace the choke and a further lengthy test run gave no hint of further bother.

I have struck this same trouble several times and always in chokes wound with fine gauge wire. Apparently the manufacturers were less careful than they should be with soldering flux and that, or some other foreign matter, had caused corrosion in the fine wire.

One might mention in passing that some early carbon resistors also gave a lot of trouble in the plate circuit of detector and audio stages. Some became virtually open circuited, and others produced a constant hissing and scratching noise. However, I have generally found that carbon resistors are consistently noisy or consistently high in value, rather than actually intermittent. I have grown to associate intermittent behavior with fine wire, either in association with a corrosive, or improperly terminated.

CONDENSER FAILURES

Two receivers this month have suffered a breakdown in the high tension circuit through failures other than the usual 0.1 or 8 mfd electrolytic bypass on the B-plus line.

In the first case I traced through the wiring and would have been prepared to bet my shirt that the 0.1 mfd condenser on the positive end of the voltage divider was at fault. Accordingly I snipped the lead and was amazed to note that the short was still present. All the leads were then unsweated from the voltage divider terminal and the short was shown to be in the divider itself.

Removal of this component from

(Continued from Page 68)

DATA SHEETS FROM A.W. VALVE CO.

THE latest issue of valve data sheets from the Amalgamated Wireless Valve Company contain full information on the 6AU6, 6SA7-GT, 3V4 and 25Z6-GT.

The 6AU6 is a miniature R.F. amplifier pentode with a 6.3 volt 0.3 amp heater and fitted with a 7-pin button base. It has a transconductance of 5200 micromhos for a total plate and screen current of 15.1 milliamps.

The 6SA7 is a well-known type which will find wide application in new receivers when the single-ended type valves are adopted as standard. The 3V4 is a miniature 1.4 or 2.8 volt output pentode with characteristics similar to the 3Q4 but with revised base connections.

These loose-leaf valve data sheets are now issued by the A. W. Valve Company as supplements to the "Radiotronics" technical bulletins and inquiries about subscription rates &c. can be addressed directly to the company at 47 York-street, Sydney.

NEGATIVE CO-EFFICIENT RESISTORS

A NEW ceramic semi-conducting material known as "Varite' has been introduced by Mullard.

It has a marked negative temperature co-efficient of resistance and has been used for the series heater resistance in AC/DC receivers where the thermal time delay provides protection for valves and pilot lamps. It differs from silicon carbide in having a negligible voltage co-efficient, the resistance depending solely upon physical dimensions and temperature.

Ceramic dielectric materials of high permittivity with a wide range of properties including zero and negative temperature co-efficients are also being produced by Mullard under the name of "Kaymax."

WALL CHART FROM PHILIPS

READY reference to current receiving type valves is provided by a new wall chart released by Philips Electrical Industries, Aust. Pty. Ltd. It lists the important characteristics and socket connections for valves manufactured over the last eight years and others projected for the current season.

The chart is available free to radio dealers and enthusiasts on application to the Head Office, through Box 2730, GPO, Sydney. For details of types not shown on the chart, a complete characteristic book is available for 1/- post free.

MORE ABOUT SIMPLE 6-METRE GEAR

Rear view of the converter. Note the 954 R.F. amplifier mounted on its side for short connections.

This month our Technical Editor takes up the story and tells of his experiences with a somewhat more elaborate converter than last month's model. The circuit of a high-power 6-metre transmitter is also included. It can be used with 809's, 811's, 812's, 35T's, etc., with equal success.

by W. N. Williams

LAST month we described a six-metre converter using an ECH35 frequency changer. This design represents just about the ultimate in simplicity, and yet is capable of good results under average conditions.

Where conditions are poor, or there is a desire to achieve better reception, higher gain and improved signal-to-noise ratio can be obtained by using an R.F. stage and separate mixer and oscillator valves. However, it is a mistake to consider that the mere installation of these separate stages confers an advantage, since a great deal depends on physical layout and the finer details of the circuit.

LAYOUT IMPORTANT

Losses and noise, due to poor physical layout, long leads, inefficient bypassing and poor choice of valves and circuit constants can offset the advantages promised by the greater number of stages. In an extreme case, a simple converter, as described last month, with short leads and careful design, may outperform an inefficient tuning system of more complex nature.

The arrangement suggested here is not necessarily the ultimate in six metre converter design, but it does use valves which are available cheaply from disposals sources and it does have an extremely good performance. All amateur stations except the very weakest are free from a background of receiver noise and the majority of them are actually workable with only two or three feet of wire for an aerial.

SIGNAL-NOISE RATIO

As in most other UHF equipment the chief requirement in a six metre converter is to obtain the highest possible signal-to-noise ratio. If it can be obtained concurrently with high gain, so much the better, since less is required of the associated receiver.

The design of the R.F. stage is quite conventional and one of the acorn type pentodes appears to be a logical choice, in view of their present price. The circuit constants shown suit the 954 and also the button-based 9001, if you happen to have one of these latter valves available for the job. To use the super-control type 956 or its button-based equivalent type 9003, the cathode bias resistor would need to be reduced to about 350 ohms and the screen dropping resistor to 60,000 ohms.

The more recent 6AK5, which combines small physical size with moderately high transconductance, is also an excellent choice for the R.F. amplifier stage, but this type has the disadvantage of being very costly and not readily obtainable.

FREQUENCY CHANGER

There is far more to the design of the frequency changer and, in this connection, some original RCA research into television receiver design provides a wealth of information. Comparison is made between triode and pentode used as mixers, and conventional heptode or hexode mixer valves.

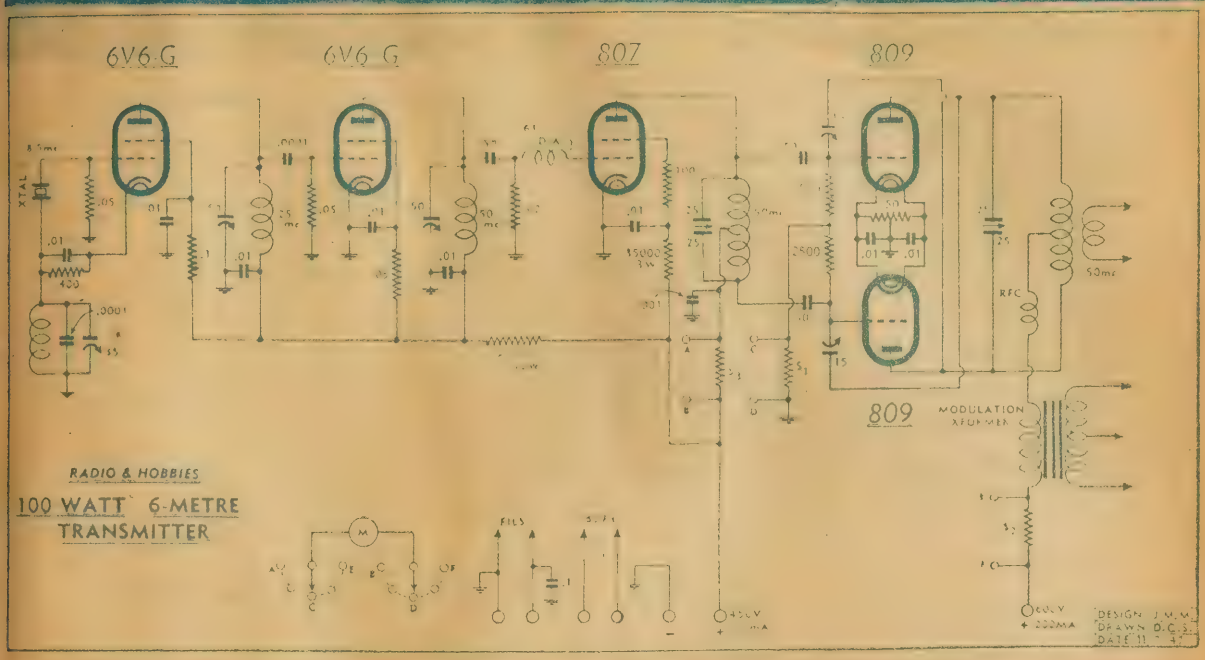
The performance of any valve as a mixer is closely related to its merit as an amplifier under the same general conditions, so that, broadly speaking, the better the amplifier, the better its characteristics as a mixer.

CONVERTER CHARACTERISTICS

Tube Type	Conv. Transconductance Micromhos	Equiv. Noise Res. Ohms Measured	Calculated	Equiv. Grid Noise Microvolts	60 Mc. Input Resistance Ohms.	60 Mc. Signal Grid Current Microamperes
6SA7 Pentagrid Converter	450	210,000	220,000	116	—10,000	5
6L7 Pentagrid Mixer	400	210,000	230,000	116	2,300	10
6J5 Triode	1,000	5,800	3,700	20	*	2
1853 Pentode	1,900	13,000	18,000	29	8,000	1
1852 Pentode	3,600	3,000	3,400	14	2,500	1

* Depends on feedback.

CIRCUIT DIAGRAM OF 6-METRE TRANSMITTER



A new high power 50 megacyle transmitter designed and operated by Editor John Moyle, VK2JU. Coil data are given below. A photograph of this transmitter appeared in last month's issue.

The tests and calculations by RCA were at a signal frequency of 60 megacycles with an assumed intermediate frequency of 10 megacycles. These figures correspond, happily, with those normally involved in the design of a six metre converter.

The first section of the paper takes the form of a discussion of four theoretical and representative valve types as mixers and the results of the investigations may be summarised as follow:

GRID MIXING

1. Optimum results are obtained when the signal and oscillator voltages are impressed on the same grid — normally the signal grid.

2. Automatic grid bias, using a grid condenser and leak, is to be preferred, and series screen feed, since both tend to provide some automatic compensation for variations in dynamic conditions.

3. Assuming signal grid injection, best theoretical results can be obtained from a high transconductance triode valve.

4. The triode mixer suffers badly from grid-plate capacitance effects, which should ideally be offset by neutralisation. If not, the performance of the stage is seriously compromised, specially as regards signal-to-noise ratio.

5. A high slope pentode with signal grid mixing, suffers slightly by comparison with a triode of equal merit. However, the grid-plate capacitance is small, output impedance is higher and comparable results are obtained much more simply.

6. Due to current partition effects, a hexode mixer with the oscillator voltage applied to an outer grid suffers badly by comparison both in respect to gain and noise. The circuit input loading is similar to that imposed by a straight amplifier of similar physical characteristics.

7. A hexode mixer with inner grid injection has different input loading characteristics but is judged to be not very much different in general performance from the other type of hexode.

OSCILLATOR-MIXERS

8. The popularity of combination oscillator-mixer valves is explained chiefly by their ease of application. They are economical and useful at lower frequencies but cease to be a good choice at frequencies of the order under consideration, where circuit loading and signal-to-noise ratio become vital factors.

9. The combination of separate oscillator with a hexode type mixer is poor as regards both gain and noise. The chief advantage of the circuit is the ease with which the signal and oscillator tuned circuits can be isolated.

10 Oscillator injection to the screen or suppressor grids of a pentode affords isolation of signals but results are not as good as with grid injection. Cathode injection is undesirable since it introduces cathode circuit inductance and increases the input loading.

Further to clarify the position, tests and calculations were related to a selection of well-known valve types, which can be accepted as typical of those an amateur is likely to employ in receiving equipment. The results of these observations are shown in the accompanying table.

CONVERTER FIGURES

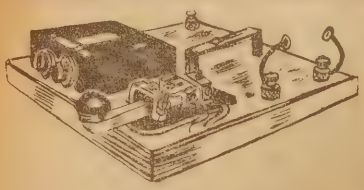
It is immediately obvious that lowest conversion gain and highest noise are exhibited by the 6SA7 and 6L7, which are typical of conventional converter and mixer valves. Other individual converters may show variations from the particular figures, but the discrepancy between this class of valve and other types is such that the hexode structure must be discounted on any grounds but those of circuit convenience.

The 6J5, which is a good but conventional triode, shows fair conversion gain but an equivalent noise figure only one-sixth as high as that for the 6SA7 or 6L7. The requirements of oscillator injection voltage are also much lower. However, as previously stated, the ultimate results with a triode depend very much on the grid-plate capacitance and its neutralisation and failure to account for this can completely offset the anticipated advantages of the circuit.

COIL DATA FOR TRANSMITTER

Oscillator Cathode Coil—7 turns 20g. close wound on valve base.
Oscillator Plate Coil—4 turns 20g. close wound on valve base.
Doubler Plate Coil—3 turns 16g. space wound ⅝in. diameter.
Buffer Plate Coil—4 turns 16g. 1¼in. diameter spaced one inch.
Final Plate Coil—4 turns ⅛in. copper tube 1½in. diameter spaced 1½in.
Aerial Coil Link—2 turns 1½in. diameter.
The above specifications should be used as a guide.

BARGAIN RELEASES



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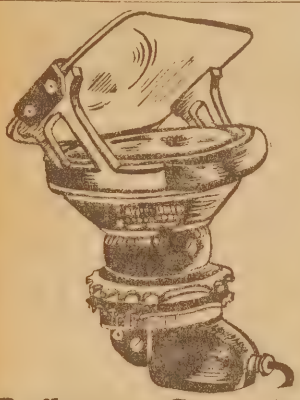

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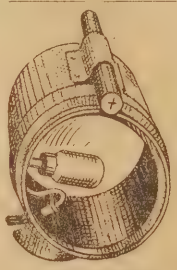

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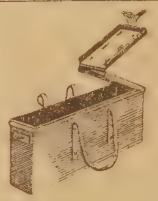

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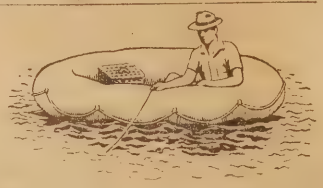

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RING AND OPEN END SPANNER — WHITWORTH.—One 7/16, ring and open end, one ½, ring and open end, one 9/16, ring and open end, one 5/8, ring and open end. CHROME RING SPANNERS, WHIT.—One ½-inch x 7/16, one 5/16 x 3/8, 1 set SPANNER, 19/32 x 11/16, S.A.E., 1 Petrol Pipe Flaring Tool, 1 2-lb. Ball Pein Hammer; 1 Tool Box, 3¾in. x 7in. deep x 15in. long.

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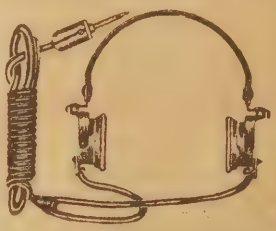

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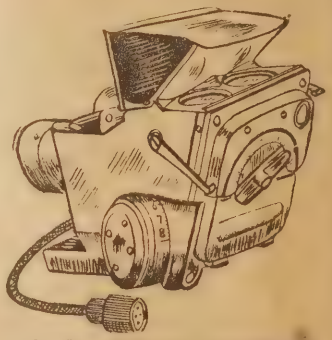

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In the tabulated data, there is a
arked difference between the mea-
red and calculated noise equivalent
sistance for the triode, despite pains
see that neutralisation was adequate.
all other cases, the measured value
noise is similar to or lower than
e calculated value.

Best results are obviously promised
the 6AC7/1852 pentode, which shows
extremely high conversion gain, with
measured noise characteristic even
tter than that of the 6J5 triode
ixer. Its high sensitivity requires
ly a minimum of oscillator voltage
jection, which is another distinct
lvantage.

The superiority of the 6AC7 in this
oup is accounted for largely by its
gh ratio of transconductance to
thode current. In this respect it
nd EF50, which are readily available
t a fraction of the price.

HE EF50

The remarks about the 6AC7 apply
general to the EF50, which is an-
her high slope RF pentode of the
me general type. Both of these
lves are available cheaply and in
bundant supply from disposals sources
d the use of one type or the other
a mixer in amateur equipment is
erefore a very logical step.

The chief disadvantage of both types
their low input impedance which
nds to load heavily the associated
id circuit. The inter-electrode capa-
tance figures are also high, parti-
larly in the case of the 6AC7. For-
nately, these effects, which become
ore serious with rising frequency,
e not prohibitive at 50 megacycles
d can be offset by tapping down
the coils.

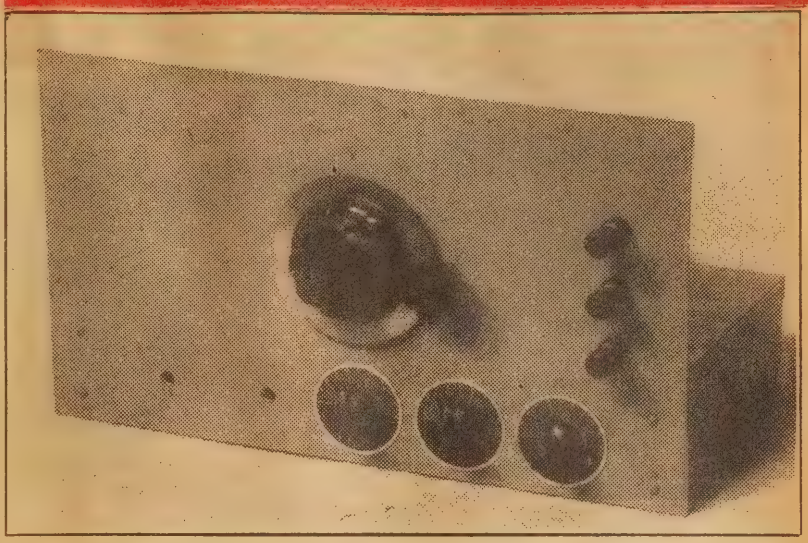
The phyiscal shortcomings of the
C7 type pentode are eliminated in
e new 6AK5, which has moderately
gh transconductance, with small size,
duced capacitances and transit time
fects and short twin cathode leads.
hese characteristics make the 6AK5
very desirable valve on the 166 Mc.
nd but its advantages are less im-
rtant at 50 megacycles. With care-
l layout and design, much the same
sults are obtainable from the 6AC7
d EF50, which are available at a
action of the price.

UNED PLATE

Referring to the schematic circuit, it
ll be noted that the plate of the
F amplifier valve is fed through the
ned circuit, a scheme which ensures
gh gain and simplifies the coil con-
ruction. Since the converter grid cir-
it should, in any case, include a
sistor and condenser, it is convenient
couple the grid capacitively to the
il, returning the grid to earth through
appropriate resistor.

Coupling the grid to the top of the
il introduces a noticeable capaci-
nce across it which, in this con-
rter, is quite simply offset by read-
stment of the manual trimmer. As
e grid is tapped progressively fur-
er down the coil, the tuning becomes
mewhat sharper, but very little
ange is noticeable on listening tests
the signal strength.

CONVERTER—FRONT PANEL VIEW



Front view of the converter, which is to be completed as a UHF superhet. Bandset and trimmer condensers are along the bottom, main tuning dial in the centre of the panel.

The best compromise between the various factors appears to be with the grid tapped about 0.7 the way up from the earthed end of the coil. In this position the input capacitance of the valve has only a moderate effect on the tuned circuit, while the loading is minimised without sacrificing overall gain. With the grid tapped still further down the coil, the tuning is sharper but gain begins to suffer appreciably.

Experiment with the grid resistor had very little effect on performance and the 0.25 meg. value was chosen as the common value which appeared to satisfy circuit requirements. The manufacturers suggest a limit of 0.5 meg. in the grid circuit with series screen feed, when the valve is used as an amplifier.

A mixer circuit suggested for the 6AC7 by the manufacturers show a 4.0 megohm grid resistor and no cathode bias, the bias for the valve being obtained purely by rectification of the oscillator injection voltage in the grid circuit. Under these conditions, the bias is entirely dependent on the injection voltage and we chose to include a bias resistor and bypass in the cathode circuit as a precautionary measure.

The conversion gain of the stage is naturally affected by the cathode resistor and a value of 400 ohms was used in the original converter, allowing ample gain without giving trouble with instability at 10.7 megacycles.

Careful thought is necessary in the choice of oscillator and the method of coupling.

The oscillator used in the first instance was a 955 acorn triode. Incidentally, we found that the cathode tapped oscillator coil was preferable to the alternative double wound coil on the grounds of simplicity and smoothness of oscillation over the band. The grid and cathode circuits were exactly as shown for the 954, but the plate was fed from B-plus through a 0.1 megohm resistor and bypassed to earth with a .001 mfd. condenser. Coupling to the mixer was provided by a 10 mmfd. condenser from the cathode tapping on the oscillator coil to the 6AC7 grid.

INTERLOCKING

This arrangement operated quite well except for an interlocking effect produced by the coupling between the RF and oscillator tuned circuits. The interaction can be minimised by reducing the coupling or even relying on random coupling, which overcomes the trouble altogether. However, the injection voltage under these conditions is likely to be less than that necessary for optimum results.

It is fairly obvious that interaction of some degree must occur if the mixer grid is coupled to any section of a triode oscillator. Accordingly we changed the circuit around to use a 954 pentode electron-coupled oscillator taking the injection voltage off the plate. Under these circumstances it was found possible to utilise an actual 10 mmfd. mica coupling condenser without causing appreciable interaction between the RF and oscillator tuned circuits.

It appears that no simple measurement exists by which a constructor, without special equipment, may adjust

COIL DATA FOR CONVERTER

AERIAL COIL: 6¾ turns 18g. tinned copper, ½in. dia., spaced to ¾in. Primary is 4 turns 24g. enamel, interwound one turn with earthed end of secondary.

R.F. COIL: 5¾ turns 18g. tinned copper, ½in. dia., spaced to ¾in. Grid tap 4 turns from earthed end.

OSCILLATOR COIL: 6½ turns 18g. tinned copper, ½in. dia., spaced to ¾in. Cathode tap 2 turns from earthed end.

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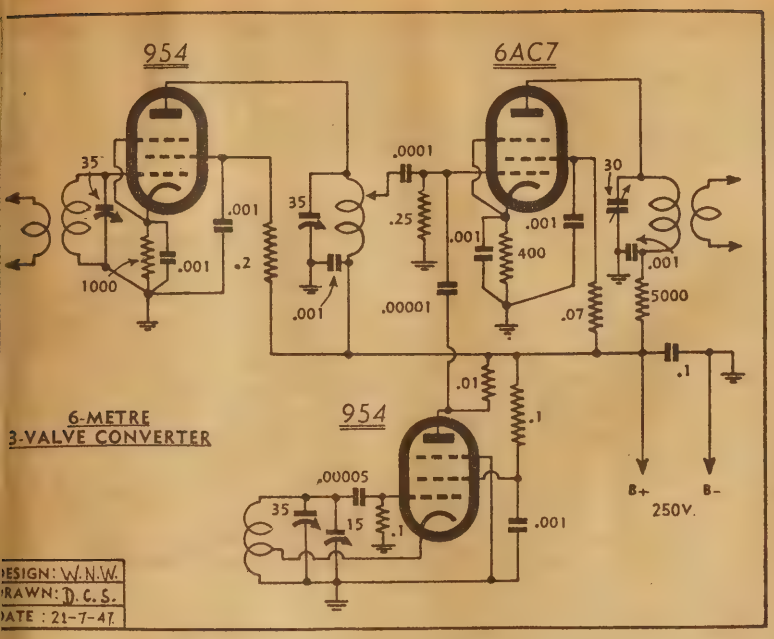

Note that earth returns for each circuit are returned to the same point. This is important for best results.

the optimum injection voltage. owever, curves of the 6AC7 as a mixer dicate that the general performance the valve remains fairly constant ce a certain minimum injection vol- ge has been exceeded.

There is, therefore, good reason to ovide fairly substantial coupling, ring on the side of too much rather an too little.

The plate of the 6AC7 is fed through output coupling coil, resonated to 7 megacycles. The plate coil has 25 rns of 30-32 gauge wire close wound a ¾in. diameter former, being tuned a 30 mmfd. variable trimmer con- nser. The output coupling comprises turns of the same wire, spaced 6in. from the B-plus end of the te coil.

YOUT

Physically, the converter layout has en arranged to give the most con- nient arrangement of panel controls d short leads. It was built on one ner of a 13-inch chassis in such a y that an I.F. channel and audio stem could be added at a later date convert it to a complete UHF re- ver.

The coils are self-supporting and unted on 6-pin trolitul plugs. They ld be installed permanently in the cuit, but we elected to use plug-in ls to allow for experiments on other quencies.

The aerial input is at the right of the nel, immediately adjacent to the rial coil. Directly underneath this the aerial tuning condenser, which mounted on the front panel and d as a manual trimmer.

The 954 R.F. amplifier is mounted its side half-way through the chas- the grid connecting to the coil ket via a short flexible lead. The te wire is similarly connected at other end to the R.F. coil plug, h its tuning condenser immediately neath.

Then come the mixer valve, oscil- lator valve and oscillator coil in a group, with the oscillator bandset con- denser nearby and on the centre line of the panel. The coil connections and tuning condensers have been arranged in such a way that the con- necting lugs solder directly together, while common centrally placed earthed points are used, as far as possible, for all stages.

The bandspread condenser, operated by the main tuning dial, is in parallel with the oscillator bandset. When tuning across the band, a slight ad- justment to the aerial and R.F. tun- ing condensers is all that is necessary to peak the output on stations.

To put the converter into operation, couple to the necessary supply volt- ages and check the operation of the oscillator. Grid current should measure between 50 and 150 microamps. A higher grid current should be avoided owing to the risk of squegging effects.

AERIAL COUPLING

Couple the output leads to the main receiver aerial terminal, short out the converter oscillator and tuned across the 10 megacycle region until a sharp peak in the noise level indicates that the receiver is tuned to the converter output frequency. Check this fre- quency on the receiver dial and move the noise peak up or down to 10.7 megacycles by suitable adjustment to the converter output trimmer.

Remove the short from the converter oscillator, couple to a 6-metre aerial and search for signals by varying both the bandset and the bandspread con- densers.

Greatest activity on the 6-metre band at the time of writing is around 8-9 pm, at which time local stations are usually to be heard at good strength. There is a promise of 6 metre DX conditions during the coming months and this converter should be ideal for such lis- tening.

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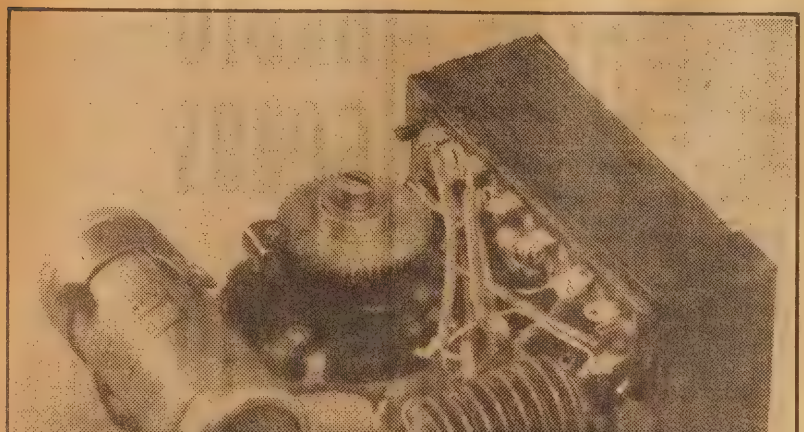
BIAS UNIT USES METAL RECTIFIER



A photograph showing the transformer with the components mounted upon it.

A home-wound transformer and a telephone type metal rectifier are the essential items in this compact bias supply. It will probably cost you less to build than the bias batteries it replaces.

A CONSIDERABLE number of telephone-type metal rectifiers are available just now from radio stores from Disposals sources. Originally fitted to relay panels, they are rated to deliver up to 48 volts at 50 milliamps. Two types are available. The copper-oxide rectifier is a solid stack of plates about ¾-inch in diameter and just under two inches long. The selenium counterpart is about two-thirds the size, is painted red and has large air spaces between the plates.

Thinking about these rectifiers one day, it occurred to us that they could be the basis of a very simple bias supply. It so happened that a modulator was under development at the same time, and we took the obvious course of designing the bias supply for the output valves.

The rectifiers in question are full-wave units, intended for use in a bridge type circuit. There are five connections in all, the two outer ones being bridged across to form one of the d-c output lugs. The d-c output voltage approximates the a-c input, depending on the load circuit. For this modulator, we required a bias voltage variable up to a maximum of about 30 volts.

Thirty volts a-c is not readily available fom any standard power transformer, so we decided to wind up a small auxiliary transformer to step up the heater voltage to the required figure. You won't find this a difficult job.

A search through spare parts should bring to light an old audio transformer and it is the work of a moment to dismantle it and remove the old windings. Note the exact size of the core centre and cut a block of cork or wood slightly oversize, drilling a hole through it to take a ¾-inch bolt. Lock the wood or cork block on the bolt and insert the end of the bolt in the drill chuck. Clamp the drill in your bench vyce and a temporary coil winder is ready for action.

Cut a strip of light cardboard to t exact width of the original windin and fold it around the cork form twice, so that there are two thic nesses of cardboard to support t windings. Put a smear of glue on ea fold of the cardboard to cement rigidly together. Now cut about eig strips of light paper to same wid as the cardboard former and put aside for future use.

The primary can be wound wi about 24 gauge wire. The exact s or type doesn't matter much, as the will normally be plenty of latitude different gauges. A heavier prima is all to the good, except that it harder to wind.

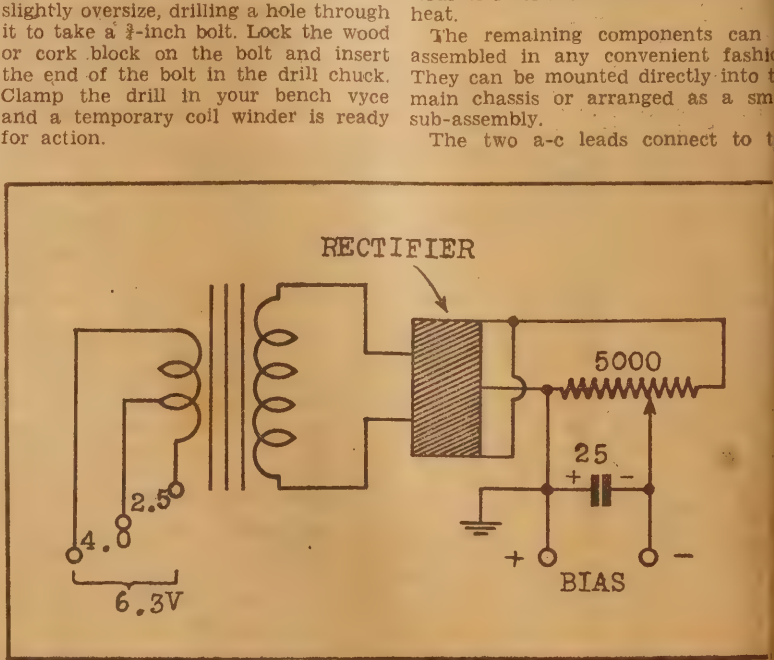
On small audio or output transform cores it is quite safe to work on turns per volt. For the primary, the fore, wind on 39 turns, bring out tapping and then add a further turns. This will allow the prima to be connected across 4.0 volts, volts or 6.3 volts.

Remember to bring out the conne tions on a side of the winding wh they will be external to the core sta Anchor the ends firmly and cover wi spaghetti tubing wherever wires cr over one another. Put a layer of pa between the primary layers and ins two or three layers of paper betwe the primary and secondary windin

The secondary can be wound wi about 30 gauge wire and you can p on 350 turns to give about 35 volts a output. Re-assemble the transform connect it across the appropri primary voltage and measure the s ondary voltage. Let it run for a ha hour or so to see that it does not ov heat.

The remaining components can assembled in any convenient fashi They can be mounted directly into t main chassis or arranged as a sm sub-assembly.

The two a-c leads connect to t



The circuit of the bias voltage supply.

inner lugs of the restifier, the centre ug and the two common outside lugs roviding the d-c output. In the sele- ium rectifier we had, the centre lug s plus and the outer lug minus. It is sually the other way around with opper oxide types. However, this point an be verified very simply with a oltmeter.

The d-c output is connected across 5000 ohm potentiometer, the positive ide being earthed. The variable bias oltage is derived from the moving rm. A 25 to 100 mfd. electrolytic ondenser between this arm and earth rovides filtering and provides an audio eturn path.

A fixed bias supply is generally de- irable in amplifier stages operating nder overbiased conditions, covering rom class AB1 to class B operation. n extreme cases the use of fixed bias an contribute to 50 per-cent. of the ower output of a modulator or ampli- ier.

The circuit shown will be quite suit- able for amplifiers drawing only mod- erate amounts of grid currents but, or high values of grid current, a lower ircuit impedance would be desirable. This can be provided by using heavier gauge wire in the transformer and reducing the value of the load resistor to a point where the bleed current approaches more closely the 50 milli-amp rating of the rectifier unit.

Bypassed with a mica condenser, the supply would be suitable for R.F. power amplifier stages. Where a bias is required above that available from a single rectifier, two windings and two rectifiers could be used, the d-c outputs being connected in series.

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RECEIVER: 6½x6½x8½". Contains six 6.3v. valves, four of which are direct replacements for 6U7G, one for 6A8G, and one for 6B6, 460 kc. IFs. Made for fixed frequency crystals, and very suitable for conversion to A.C. or D.C. B/C receiver.

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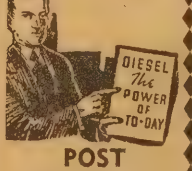

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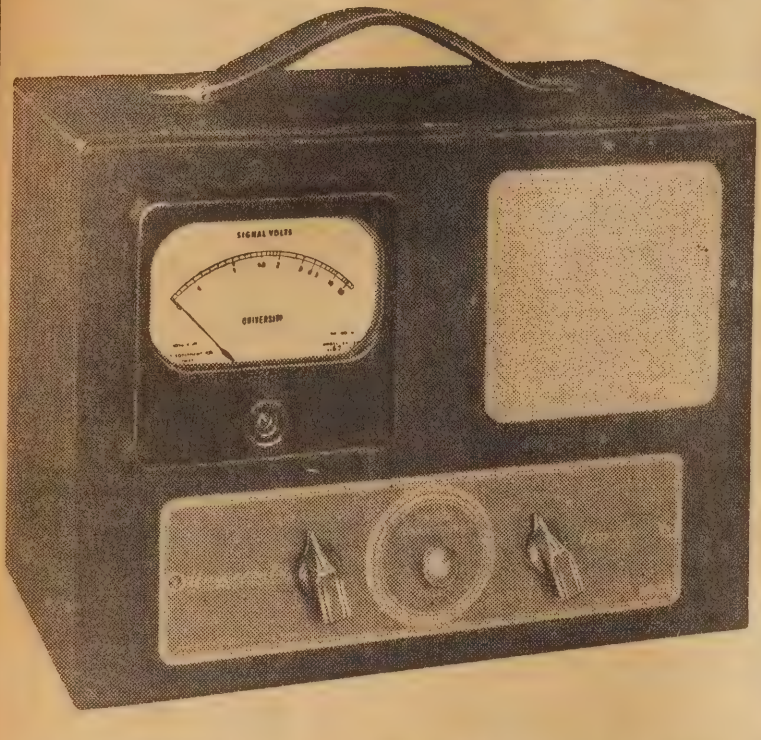

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SERVICEMAN MAN TELLS

(Continued from Page 59)

the chassis revealed that the end mounting bracket was actually bearing against the end connection to the resistance element. Unfortunately I could put it down to nothing other than a manufacturing fault. The reason for it was that the clip was fastened around the extreme end of the cardboard former and there could never have been more than the merest fraction of an inch clearance between the clip and the end mounting bracket.

The high tension voltage, and perhaps some slight additional bending of the bracket during assembly, had allowed an actual short circuit to develop. I had noticed that some of these voltage dividers allowed for very little spacing, but here was an example of an actual breakdown. So constructors could well watch this point during the assemly of a set and see that there is no chance of a short between the positive voltage divider lug and the mounting bracket.

A TONE CONTROL

The second breakdown was different again in character. The owner explained that the receiver had lost volume all of a sudden, then apparently righted itself, but that subsequently the tone control had no effect. Or, rather, it had no effect until it was turned right off, at which point it cut out the signals altogether.

The explanation, of course, gave the key to what had happened. As I expected, the circuit turned out to be as shown in the accompanying diagram. The tone control actually takes the form of a potentiometer in series with a tubular condenser, the combination connecting the output plate and earth. The condenser bypasses the treble frequencies, its effect being limited by the setting of the series potentiometer.

In this case the condenser had broken down and the high current through the potentiometer had open circuited the resistance element—it was of the wire-wound type. The control, therefore, became ineffective, except that, in one extreme position, it shorted the output plate to earth through the broken down condenser.

REPLACEMENT

Anyhow, it was a simple matter to replace the faulty potentiometer and condenser, but I used a carbon potentiometer and connected the rotor connection to B-plus instead of to the chassis.

This makes things easier for the condenser in that it has to withstand only the a-c signal voltage rather than the peak sum of the a-c signal voltage and the d-c plate voltage. On loud passages these can quite easily exceed the 400 volt rating of the usual tubular condenser. In nine cases out of ten the condenser is OK, but, in the odd case, it causes trouble.

TRADE REVIEWS AND RELEASES

EDDYSTONE COILS AT MARTIN'S

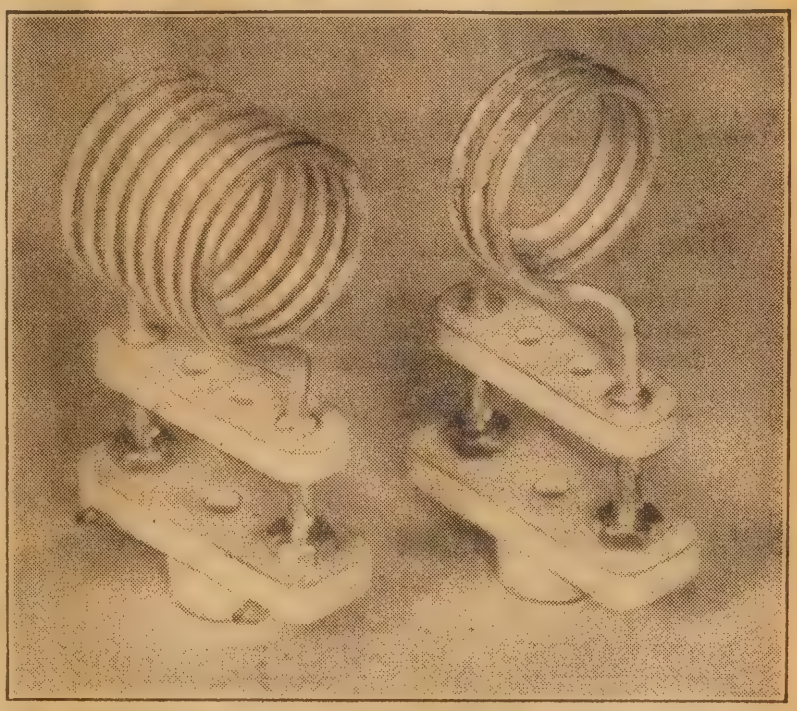
Picked up at John Martin's the other day were these two coils made especially for V.H.F. work. They are silver-plated, and display excellent finish.

EDDYSTONE have always specialised in components for these frequencies, and without exception, their products display a fine standard of engineering.

These coils, made in a variety of sizes, are wound with silver-plated copper wire, self-supporting, and are mounted on ceramic strips. The ends of the wire project through these strips, and plug into the sockets of a special mounting base.

As the more-than-full-size photograph shows, this base is of the one-hole mounting type, and spaced a small distance from the chassis.

The sockets themselves are self cleaning, and sprung for good connection. Solderlugs are provided for the connections.



REPLACEMENT FOR TYPE 1B5/25S

WE have received the following information from the Amalgamated Wireless Valve Co.:.

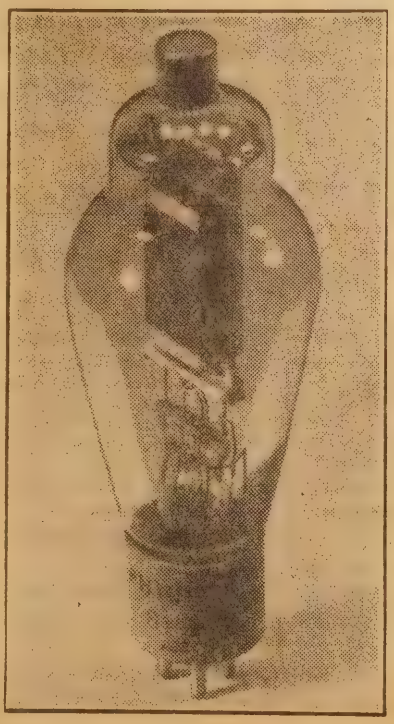
Radiotron type 1B5/25S is at present in very short supply and there is no immediate prospect of relief. On the other hand, type 1H6-G is in abundant supply and has the same electrical characteristics as type 1B5/25S. It is suggested that radio servicemen might use type 1H6-G to replace type 1B5/25S so long as the present condition of shortage continues. The only change which need be made is the change of socket from a 6 pin to an octal type. In making the change over, pin 1 of the octal socket is left without any connection but all the other pins are connected in the same order as the pins of type 1B5/25S, leaving the last pin (number 8) unconnected.

Details of the socket connections of the two types are given below for ease of reference:

Type	1B5/25S	1H6-G.
Socket	6 pin.	Octal
Pin 1	Filament x	No connection
2	Plate	Filament x
3	Diode No. 2	Plate.
4	Diode No. 1	Diode No. 2.
5	Grid	Diode No. 1.
6	Filament -	Grid
7	—	Filament -.
8	—	No connection.

PHILIPS HAVE 812's AND 811's

AT STANDARD PRICE OF 34/9 EACH



We were pleasantly surprised to find that both 811 and 812 types can be obtained on the above basis, as they hold a special appeal, particularly for amateurs.

THE valves are essentially identical in performance except that the 811 has an amplification factor of 160, making it a splendid class B audio valve. Two of these will give up to 220 watts output at 1250 volts, with corresponding lesser amounts at lower voltages.

The 812 is the R.F. version, and will give a maximum output Class C Telephony of 120 watts at 1250 volts, with 6 watts driving power. With 1000 volts and 105 watts input, its output is 82 watts. This latter rating is of special interest to amateurs.

The filaments are rated at 6.3 volts 4 amps. Our tests, carried out up to 50 megacycles, fully confirm the makers' efficiency ratings.

DEVICE ANSWERS PHONE

SWISS telephone subscribers can now have a device which records incoming messages if there is no one at home to answer. The Ipsophone even will repeat the message to the subscriber if he calls his home and goes through a prescribed code procedure.

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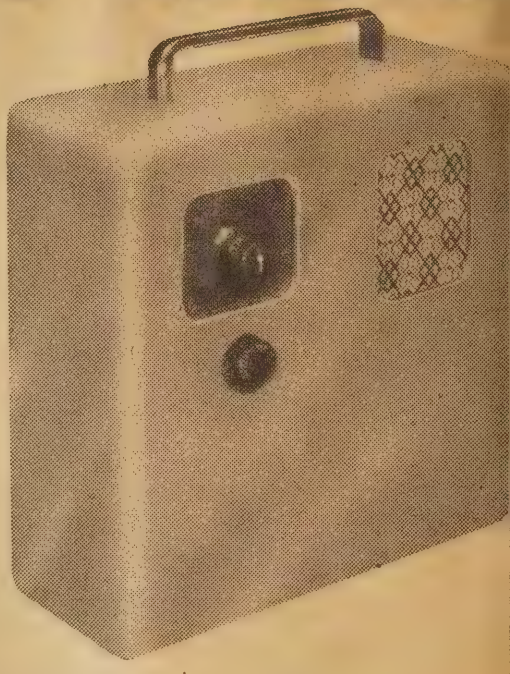

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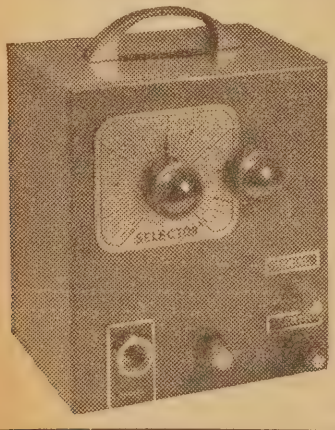

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In August 1922 the late A. F. Price commenced retailing radio parts from his newsagency in Oxford Street, Woollahra, the "Price's Radio Service Station." During the next few years the phenomenal demand for radio components made it impossible for him to carry on a newsagency and Radio business together.

1926, the business was removed from Woollahra and established in small shop, No. 9 Wingello House, gel-place, Sydney, and the title was rtened to "Price's Radio Service." ly in 1928 a further move was made a larger shop, No. 7 in the same lding. In June of that year Mr. an Falson joined Price's Radio Ser- as Mr. Price's assistant. At this e, keen interest in short-wave re- tion commenced the "Ham" section the business.

further move to larger premises the same building was made in), and two years later Mr. Falson appointed manager. The period n 1931 to 1935 was a very difficult for radio, but while many retail io firms in Sydney disappeared, ce's Radio Service weathered the m.

January, 1935, Mr. D. G. Mc- re, for many years manager of doch's radio department, purchased business from Mr. Price. Mr. Mc- re was one of the very early ams" holding a licence in New land just after the first world war, and becoming A2VX after arriving in Australia. Naturally, he was keen to see the "Hams" helped along, and arrangements were made with overseas buyers to secure good lines from both UK and USA. This policy was maintained until war was declared in 1939.

During the war years the staff was reduced to Mr. McIntyre, with the part-time help of his sister, Mrs. Bellfield, who did a remarkable job under the most adverse circumstances.

At the conclusion of hostilities, Mr. Falson returned after 3½ years at the Radiophysics Laboratory, and a start was made on reorganisation.

In January, 1946, the services of Mr. Macnaughton, VK2ZH, who spent six years as a RAAF signals officer, were secured to handle the "Ham" fraternity, and Mr. Bruce Robertson was demobilised from the RAAF signals and took over the mail order section.

In June, 1946, the title of the firm was again shortened and is now known as "Price's Radio."

The staff today is considerably larger than at any time in the firm's history, and renders prompt and efficient service.

At the present time considerable quantities of goods ex disposals are being handled to augment the limited supplies of new stocks that are available. An endeavor is being made to secure supplies of good "Ham" lines from overseas.

The future policy is to carry a greater variety of high quality components to manufacture locally many "Ham" lines, and above all, to keep prices at the lowest possible level.

GEORGE DOYLE JOINS KINSLEY

Mr. Lay W. Cranch, general anager of Kingsley Radio Pty. d., Melbourne, after a recent visit Sydney, announced the appoint- ent of Mr. George W. Doyle as les and advertising manager of e company. Mr. Doyle entered on his new duties on July 1.

R. DOYLE, who has been con- nected with the radio and elec- al industry for more than 20 years, be remembered as the founder and aging director of Industrial News- rs Pty. Ltd., Sydney—publishers of Electrical and Radio Merchan- r." He has been the managing or of that journal since its incep- in 1938.

ngsley Radio Pty. Ltd. will shortly ounce the release of a number of products, and Mr. Doyle will im- ent the sales policy of Kingsley's known lines from the head office e company in Melbourne.

od luck to you, George, you will inly have some good products to !

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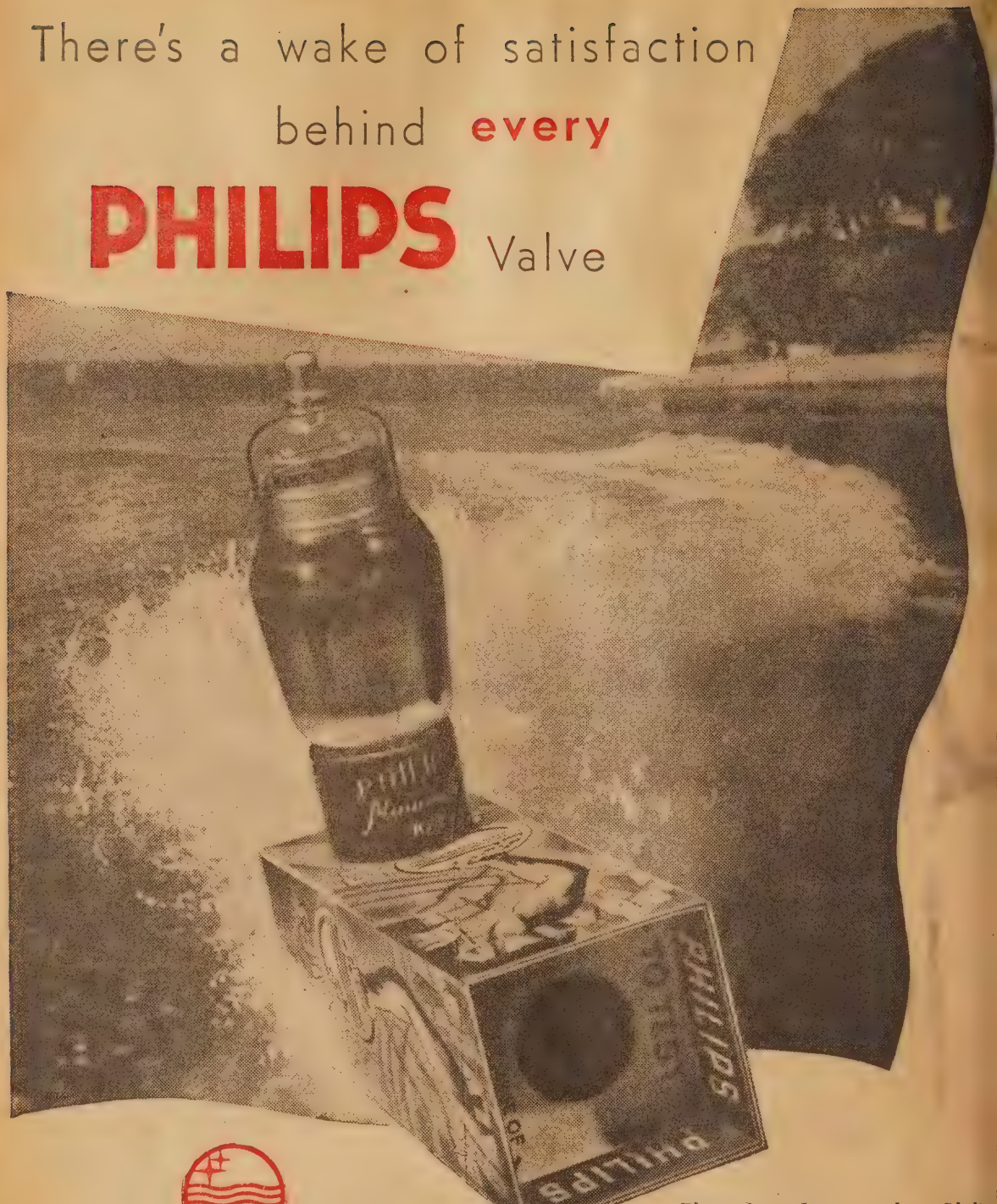

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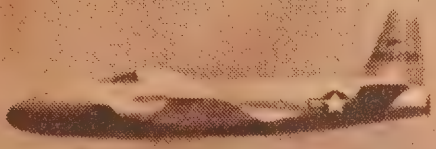
SHOOTING STAR CLOCKS 623.8 M.P.H.



P-80R FLASHES TO NEW WORLD SPEED RECORD—A Lockheed P-80R Shooting Star flies across a measured three-kilometer course while setting a new world aircraft speed record of 623.8 miles per hour, exceeding the British mark of 616 mph set last year.

Col. Albert Boyd of the Flight Test Division at the Army Air Forces Material Command, Wright Field, climbs out of the P-80R Shooting Star in which he captured the record.

B-36 Assembly Line—The Assembly line at Consolidated Vultee Aircraft Corp's. Fort Worth Division, loaded with six-engine B-36 bombers being built for the Army Air Forces. An announcement from the Company and the Army Air Forces said 13 of the superbombers are now on the final line. The bombers on the line must be canted to make room for their 230-foot wing spread.

STORY OF THE FAMOUS THUNDERBOLT

This is the P-47C, the first type of Thunderbolt to be sent to England for combat. It shows clearly the massive proportions of the big fighter, and the lines which made it so easily recognisable.

One of the most famous fighter aircraft of the last war was the Thunderbolt. Almost certainly it was the heaviest and most imposing in stature. As with most other well-known aircraft, it has an interesting history of development and achievement. It proved capable of many services which were demanded as the war progressed.

THIS is the story of a famous fighter plane which wrote its own history in the skies over Europe and later over the vast Pacific.

Seven years ago, in June, 1940, an Army Board called a meeting at Wright Field to review the limitations of existing fighter aircraft for the purpose of radically improving fighter performance along lines dictated by combat reports from Europe.

Travelling from Farmingdale, Long Island, representing Republic Aviation, were C. Hart Miller, Director of Military Contacts, and one of America's foremost but little-known aircraft designers, Alexander Kartveli.

The P-44, the Russian-born Kartveli's latest fighter design, was then in the works of Republic.

SPECIFICATIONS

But the board produced an immutable specification for a fighter plane incorporating potentials of performance hitherto untouched.

It demanded a plane able defensively to exceed anticipated ceilings of hostile bombers, and outgun them; offensively, to escort and provide competent cover for American bombers flying in the substratosphere, and outfight enemy interceptors.

Such requirements necessitated a super-horsepower power plant, high altitude supercharging, heavy firepower, armor protection for the pilot, self-sealing tanks, a maximum of manoeuvrability and a 400 mph plus level speed.

It was almost immediately evident that to incorporate the necessary modifications into the P-44 was to vastly increase wing loading, the ever-present bogy of performance.

The ensuing discussion led inevitably to abandoning P-44 and designing a new plane, albeit along the P-44 lines, which would incorporate all the "must" features.

Right then and there, on the back of an envelope, Kartveli roughly sketched the fighter which was to emerge.

A YEAR PASSES

Less than one year later, on May 6, 1941, Republic Test Pilot Lowry Brabham jumped from the wing of a massive fighter, after its first successful test flight.

Obviously it had not been as easy as it sounded.

Years of experimentation and trial had been crammed into 11 months.

by

Boris Carone

It may be worth while to des briefly the design sources from w the Thunderbolt stems, bearing mind that the new fighter is ess ally a new design.

In 1937, a first-rate, high-perf ance fighter, the P-35, emerged the draughting board of Kartveli, chief engineer for the Seversky craft Company, which later be Republic Aviation Corporation.

Its president, Alexander de Seve had Kartveli design the plane, w performed well, but cost so muc build that most private pilots c not afford to buy it.

Sversky then had Kartveli design it into an Army basic tra subsequently into a pursuit p which the Army purchased with designation P-35.

THE P-35

The P-35 was a remarkable p for its time.

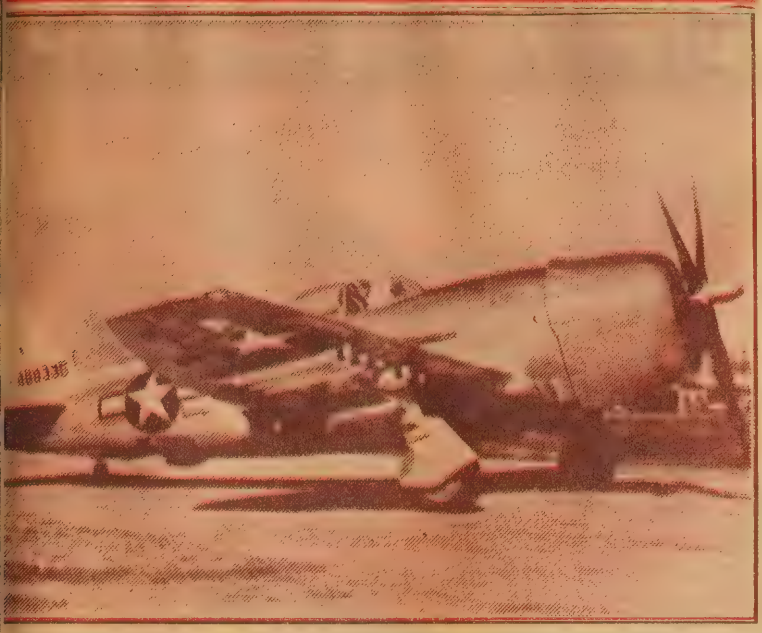
The first all-metal, low-wing, speed combat plane, it achieve better-than-320 mph speed.

Powered by a Pratt and Wh engine rated at 1200 hp, it had a vice ceiling of more than 30,000

Then followed the AP-4, pow by a Pratt and Whitney R-1830 gine utilising turbo-supercha and the XP-41, utilising a two- two-speed engine.

New scientific data of inestim

LONG-RANGE THUNDERBOLT



he P-47N was the long-range version designed mainly for the Pacific. Its 22.7 extra quare feet of blunted wing carried 192 gallons of extra fuel. Note its heavy armament.

e was gained from tests of these es and, armed with the knowledge, veli designed the YP-43, which quickly followed in 1939 by pro- ion of the P-43 Lancer for the AF and foreign countries, includ- China.

ıe Lancer enhanced Kartveli's re- tion as an aircraft creator with lent for high-altitude design.

ıe P-43 was classed as the best ber in those days.

ıose who read Colonel Robert t's "God Is My Co-Pilot," will ll his stirring account of his flight Mount Everest during which he a P-43 to 44,000 feet to view the alayas.

eanwhile, Kartveli had designed beautiful P-44 which never saw a uction line.

ırtveli was determined that no ısions should mar the aero- ımic efficiency of the P-47, and Thunderbolt is as clean as a tle, externally.

SUPERCHARGER

parently the toughest installation lace was the washing-machine size o-supercharger, which was driven he violent force of exhaust gases lled from the 2000 hp. Double o's eighteen cylinders.

was eventually installed aft of the pit at the end of a duct, wide gh for a full-size man to enter h leads forward to its mouth is located at the bottom of the ne cowling.

rough this duct rushes the air ned into it by both prop blast and forward speed of the plane.

e complexity of the installation is suggested by the operation of the turbo-supercharger.

The exhaust gases activating the blower must be collected and directed back into the super-charger through an asbestos-encased pipe from which branches another passage where excess or unwanted gas can escape.

The duct via which fresh air is supplied to the turbo likewise passes through the fuselage, and has a branch for supplying cold air to the intercooler to control the temperature of the compressed air entering the carburettor.

Finally, the compressed air must be fed back into the engine which, at times, may be called on to perform at maximum efficiency in substratosphere temperatures of 60-70 degrees below zero where the air pressure may only be one-seventh that encountered on the earth's surface.

The Thunderbolt has a phenomenal performance for its gross take-off loading weight of some seven tons.

Pound for pound, it may still be the world's highest-climbing single fighter aircraft.

It has been successfully dived at supersonic speeds.

In the closing stages of the war, an AAF pilot in England, Lieutenant-Colonel Cass S. Hough, dived his P-47 at more than 780 miles per hour.

He started the dive at 39,000 feet, and pulled out at 18,000.

In announcing this feat, the USAAF headquarters for the European theatre of operations did not reveal specific speeds, confining itself to a statement that "although speed attained was a military secret, it can be said that Colonel Hough travelled faster than the speed of sound, or more than 780 mph."

DIVING SPEED

Colonel Hough travelled faster than 1150 feet per second, which is the speed of sound in dry air at zero temperature.

As a combat fighter, the Thunderbolt has shown great ability to take a terrific beating and still get back to its base.

More than one RAAF pilot flying P-47's against the Japanese returned home with sixteeen or eighteen 20mm. shell holes in his plane and climbed out to fly and fight another day.

From the P-47 emerged the Xp-72. The Xp-72, of which only two were built, was designed as a medium interceptor fighter.

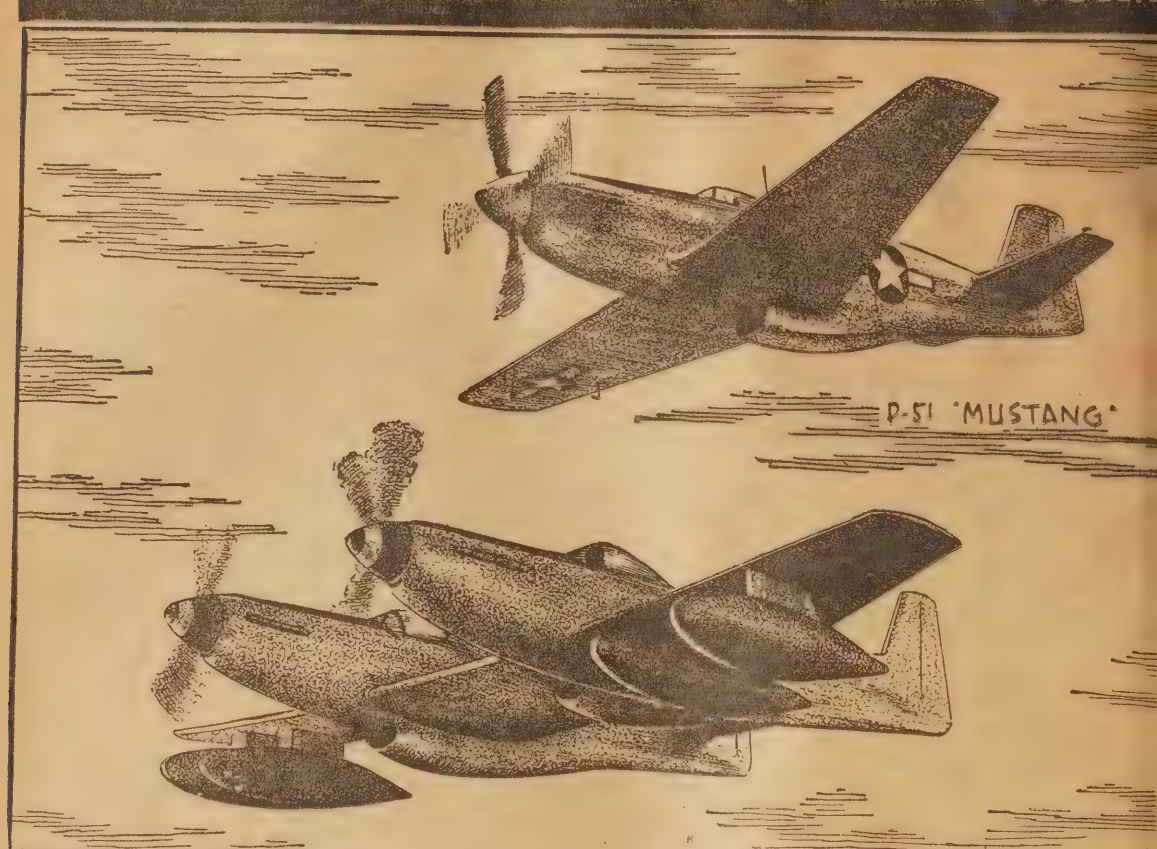
The weight, empty was 11,476lb.; design gross weight of 14,433lb., and an overload gross weight in excess of 16,000lb.

Like the P-47 the Xp-72 was an excellent climber. With war emergency power it could climb from sea level to an altitude of 15,000ft. in 3½ min.

Despite the excellent performance characteristics the Xp-72 was never put into production; because immediately the war closed, production was turned over to meet commercial needs.

The XP-72 was rated at 504 mph at 25,000ft. With full war emergency power, it could climb to 15,000ft. in 3½ minutes.

MUSTANG FIGHTER SEEN IN NEW FORM



A fighter of unusual capabilities is the US Army's new Mustang Twin, the P-82. Designed for very long distance flights, the novel aircraft is virtually two Mustangs (P-51's) joined at the wings and with a single tail plane extending across the rear end of the fuselages.

THE P-82 carries two pilots, one beneath the canopy in each of the fuselages.

Not only is speed remarkable but exceptionally heavy armament is carried.

In February last, a P-82 completed a 4978-mile non-stop flight from Honolulu to New York in 14 hours 33 minutes—the longest distance ever flown by a fighter-type aircraft. Over part of the flight the plane had to battle against 60-mile headwinds, but the average speed for the flight was more than 340 miles an hour.

POWER UNIT

Power comes from the 2200-horsepower motors. Top speed is reputed to be more than 475 miles an hour. The machine can carry six machine-guns, 24 rockets and four bombs.

Features of the original Mustang's design which are prominent in the new adaptation include the distinctive wing which shows an extremely sharp leading edge with the maximum thickness at the centre of the wing section. The square fin and rudder are retained.

COOLING SYSTEM

Another unusual feature of the Mustang retained is its radiator installations for the ethylene glycol engine coolant. The air intake is a large scoop beneath each fuselage just behind the leading edge of the wing, while the radiators themselves are within the fuselages. Ducted air channels lead from the intake scoops to the radiators, and from there to the exhausts.

The P-82 has a wingspan of 51ft. and is 36ft. long.

The sketch here of the P-82 shows a plane fitted with four auxiliary fuel tanks which are attached beneath the wings.

At the top is the P-51 Mustang, itself characterised by long operational range and great speed. During World War II, Mustangs were generally credited with making the longest fighter sweeps, US Army planes [illegible] type making 1700-mile roun[illegible] flights from Iwo Jima to lower H[illegible]

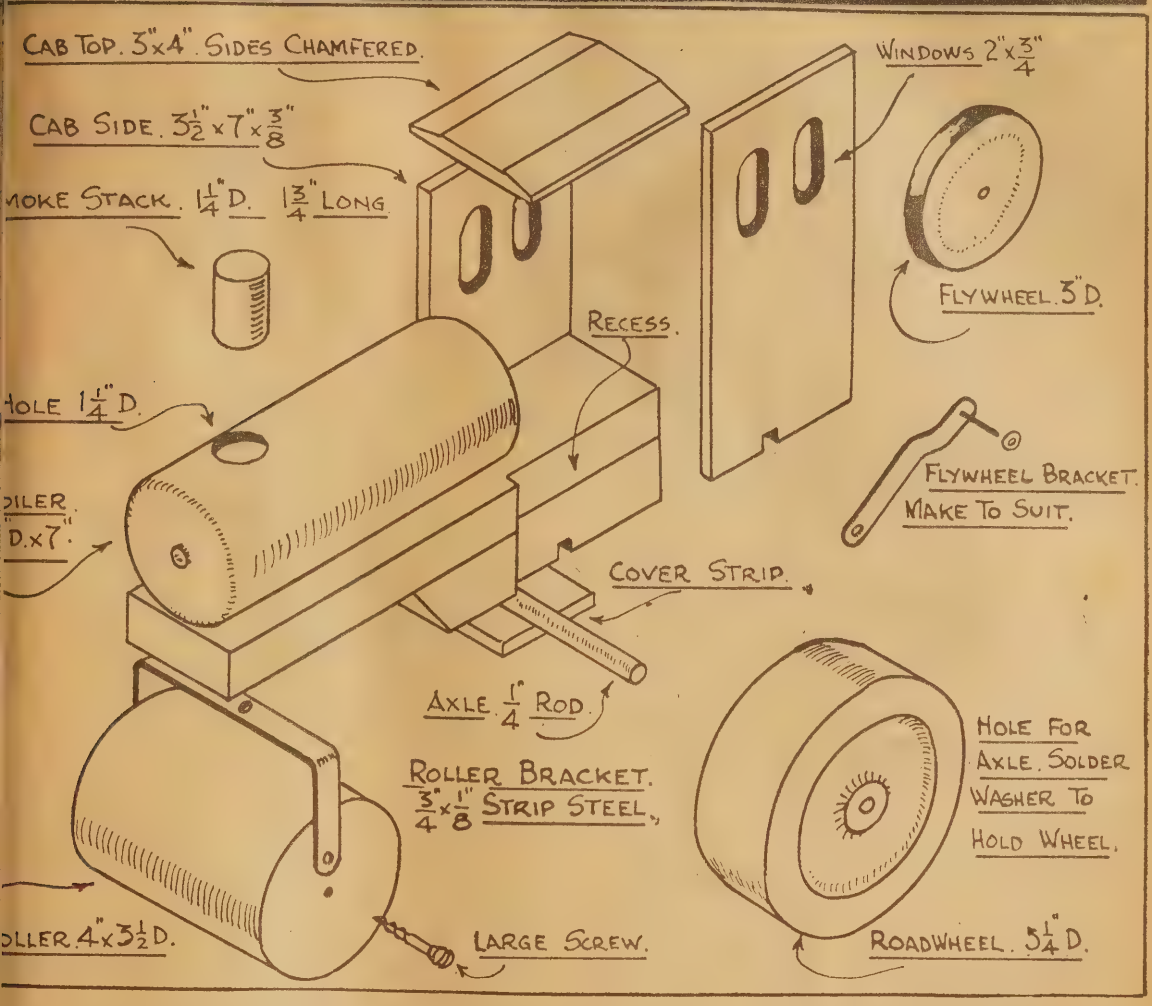
On February 28 last a US Mustang set a new speed recor[illegible] single-engined propeller-driven on the non-stop transconti[illegible] flight from Burbank (Californi[illegible] New York. The 2446-mile ho[illegible] covered in 6 hours 7 minutes 5 se[illegible]

Helicopters at W[illegible]

AFTER six months of ope[illegible] Helicopter Air Transport, [illegible] helicopter airline, quotes charter[illegible] costs at 75 dollars and 125 [illegible] per hour for Bell and Sikorsky h[illegible] ters, respectively. Passenger rat[illegible] 35c. per mile, limiting pass[illegible] primarily to top executives a[illegible] sightseers.

HAT has been chartered by [illegible] utility companies to check [illegible] tension lines, helicopters perform[illegible] manhours of work in one hour. [illegible] dusting appears as a future pos[illegible] in addition to publicity and spo[illegible] work.

IOW TO MAKE A MODERN STEAM ROLLER



lere is a toy for the three to four-year-old child. Its solid construction enables it to stand o to rough handling yet at the same time it will take a lot of punishment with a minimum f damage. Construction is a combination of wood and metal which gives the greatest compromise between strength and appearance.

by T. E. Le Sueur

PPOSE we commence with the eces requiring the use of a lathe. oiler and smoke box first is a ler of 2¾in. diameter about seven long. The front end of this l be rounded to a pleasing curve. ear this front end a 1¼in. hole e drilled to take the smoke stack n. dowel about 2in. long. When these two pieces can be glued er. The roller is also a cylinder 3¼in. diameter and 4in. long. the centres of the ends carefully d for they are needed for screw later on. Take a slight chamfer th of the edges to improve the ance and prevent splintering.

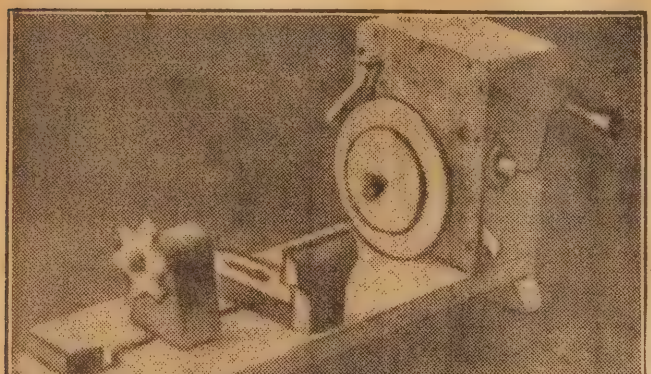
road wheels are turned from t of a piece of timber two inches Do this job on the face plate ecess the faces of the whels as wn in the sketch. Be careful ve a boss about 1in. across in entre. A 5/16in. hole will be drilled through here to take the steel axle. Further, a small disc about 3in. in diameter is needed for the flywheel which is later fastened by means of a metal bracket to the frame. This completes the turnings.

The frame is made from two pieces of timber, one 10½in. x ⅞in. x 2¼in., and the other 7in. x 2in. x 2¼in. These have to be glued and nailed together after the front end of the thicker piece has been chamfered as shown in the drawing. Keep the ends and the sides level when joining them together. Dress the edges and ends after the glue has set. At the double thickness end of the frame two recesses are cut to take the cab sides which are made from two pieces of ⅜in. ply 3½in. x 7in. Temporarily tack them together, set out the shape of the windows and saw out the waste. Dress up the edges and ends, and the sides can be separated then nailed in place in the recess provided for them. The cab top is made from ⅜in. material about 3in. x 4in. The chamfered sides are sanded after final assembly. Glue and nail the cab top in place.

The underneath side of the boiler is planed slightly flat and, after making sure that it is centred on the frame, fasten it in place. When all of the glue has set, clean up the whole of the job on the sand wheel, smoothing off all of the uneven patches. The road wheels are supported, using ¼in.

(Continued on Page 81).

GRAMO. MOTOR POWERS WOOD LATH



Here is a sketch of the finished lathe, and a specimen of the work done on it.

HAVING a cheap, portable gramophone, operated by a single-spring motor, the writer often wondered what he could do with it. The motor could not take the "drag" of some of the louder passages in orchestral records. It slowed up considerably at these points, returned to normal speed at the smoother parts of the recordings.

Realising the great power at the centre of the turntable, it occurred to the writer that a small lathe could be operated by the motor spindle if the latter were fitted with a suitable spur (for gripping wood to be turned) and the power augmented with a flywheel.

Flywheel? Surely the gramophone motor spindle, with the motor running at full speed, hardly warranted a flywheel? A little further reflection, however, showed that the turntable itself acted as a form of flywheel. Excellent! Retain the turntable as a flywheel. It would also make a good face plate for "fluting" small toy wheels with a gouge.

It was then seen that the diameter of the turntable (10in) did not fit in nicely with the scheme of things. It was too big—the lathe would be more like a bacon-slicing machine than a miniature lathe of conventional arrangement. Why not reduce the diameter of the turntable and make up the loss of centrifugal force with a "ring" of lead cast in a wooden mould, which could be attached to the plate?

That, briefly, was how the writer managed to convert a useless g phone motor into a small, useful turning lathe. The lathe need winding handle, the speed reg and stop-start fitting.

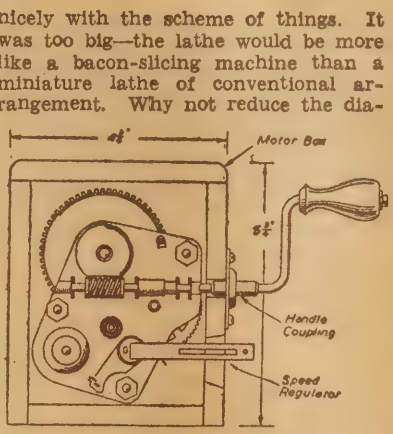


Fig. 1.—Showing how the gramophone motor jibs within its wodden box.

WHAT CAN BE TURNED

It is not every reader, of who can make use of, say, a 1 electric motor for driving a small Some do not have the electric particularly in country distric out of the way places. Others h the room for a proper treadle-op lathe. Moreover, many reade pecially model-makers, only req small compact lathe, capable of ing model galleon parts, such as eyes, gun barrels, wheels, &c., making of turned legs for doll's furniture built to a scale, possi 1in to 1ft.

All these things and many othe items not mentioned, can be on the clockwork lathe illustrate does not need electrical current, put in extra work by treadling. the motor wound up fully an flywheel revolving at its max speed, one can concentrate o turning independently for minutes. The heaviest work p with the lathe is the model k table leg shown at Fig. 9, and co ing the source of the power th of leg is quite good. All turnin cidentally are made from leng dowel rod, from 1in diameter diameter, but more about the ling later on.

THE MOTOR BOX

At the moment, the reader will ably be wondering if any ki spring gramophone motor cou utilised. Any type may be emp and for preference the motor have a double spring. Since yo be using a larger and stronger the lathe sizes must be altered a ingly.

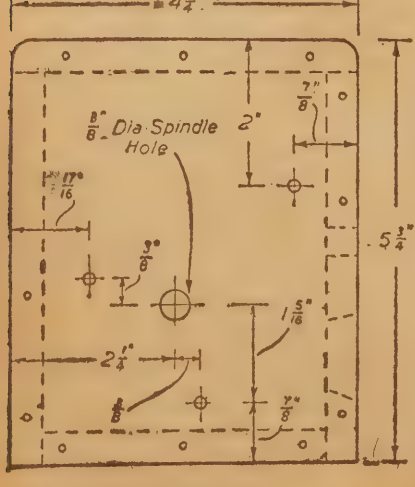
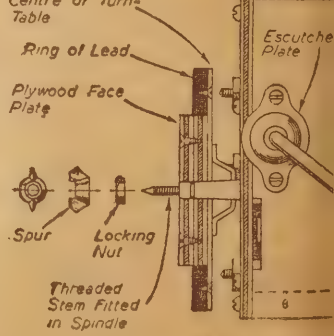
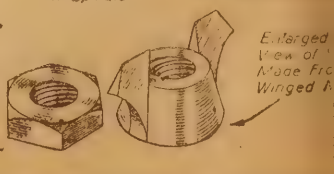


Fig. 2.—(left) Front and side of motor box.



Side view of motor box showing flywheel in section.



e readers possessing an old e gramophone (a type which bout 30/- in prewar times!) e able to proceed on the lines as the writer, since otor is sure to be of similar nd size. A good view of the is shown in Fig. 1.

motor must be housted in a box as shown in order that the handle is true with the side box. The box is made from 7-16in thick deal, with prefer-16in thick plywood for the back ont, although plain fretwood serve. A front and side piece iled in Fig. 2. The front is for the motor spindle, and its notor-board bolts, the side piece hecked for the winding coupling eed regulator in the manner in-

PEED REGULATOR

n the sides and top and bottom f the box are nailed together in oval nails), attach the back nt and level off by glass-paper-e top corners may be rounded Unscrew the front and fit the within the box; replace the front that the spindle and fixing les are truly bored.

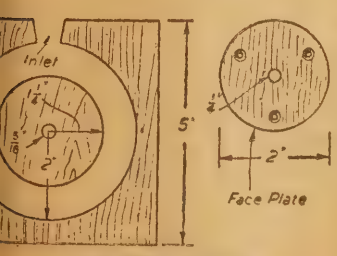
speed regulator rod has an ex- strip, which is not wanted. e this and reduce the length of gulator so that it projects about m the side of the box. You ily reduce the length by putting in the metal.

ng done this, fit on the front lt it to the motor prior to add-e fixing screws, the latter being six roundhead iron screws.

VINDING HANDLE

winding handle requires to be d in length. This means re- the threaded stem which into the coupling. A fresh however, can be easily formed end by means of a fine hack-n "Eclipse" type) and triangular lternatively, a new thread could with a suitable die; but, pro- the rough, filed thread gets a rip in the coupling, such will

her plan is to bend a "crank" he original threaded end of the



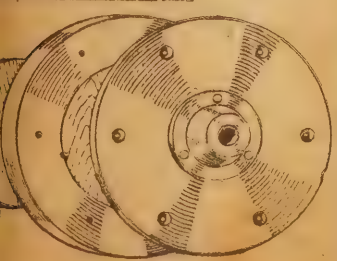


Fig. 5.—(right) Plan and side view of lathe bed, and details of feet.

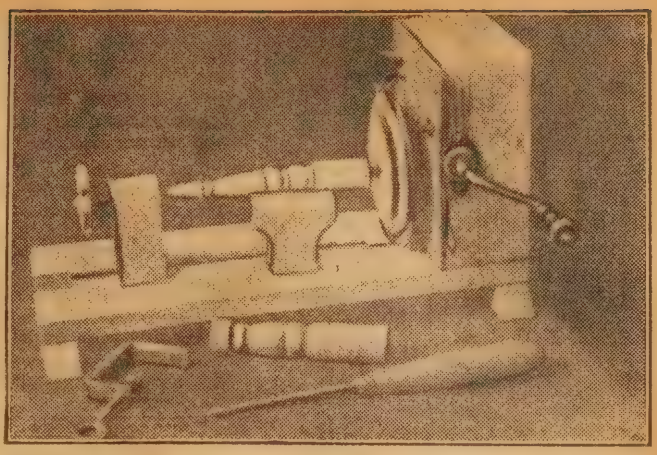


Fig. 3.—(right) Another sketch of the lathe.

handle and dispense altogether with the proper wood handle. If this suggestion is adopted, the metal must be softened (by heating and allowing to cool gradually on cold cinders), otherwise it will snap. Bending is done in a vice or the metal jaws of a sash cramp.

Model Flying Activity

TO date, the amount of model aeroplane activity since the war has been somewhat disappointing. We did anticipate that when things began to settle down again, more people than ever would be building and flying models. But strange to say, so far we have not received any great encouragement in our efforts along these lines, which, of course, can only be worth while if there are enough enthusiasts to read and make use of any articles we may print.

What about it, you fellows? We'd like to know from you on this matter, with any suggestions you have to make about the future of model flying. Tell us what you'd like to see published, and how you'd like to see the game organised. If there is enough to work on, we'll do our bit. What about yours?

As stated previously, the flywheel is cut from the centre of the gramophone turntable, given in Fig. 3. The central part of the turntable, when cut out, makes the proper face plate, but only for the lead weight. The actual face plate is a disc of plywood. This is really a packing piece against which a disc of wood—not more than 2in. in diameter, by ¾in. thick—is attached, by a thin washer, and winged nut, in fluting toy wheels.

The diameter of the flywheel is 4in. Plug the spindle hole in the turntable with wood and scribe the diameter on the surface of the turntable with compasses. It is being assumed, of course, that the velveteen cover and plated rim has been removed from the turntable.

The plate is best cut away by fitting an "Eclipse" hackshaw blade in a fretsaw hand-frame and cutting the metal much in the same way that wood is fretsawed. The "lugs" on the hacksaw blade will need to be removed and the length of the blade reduced to about 4⅜in. or 5in. The hackshaw blade mentioned is the small, fine-toothed type fitted in a wire handle frame by spring tension.

The plate is drilled and countersunk for six 3-8in. by 4 flat-headed iron screws, as in Fig. 4. The flywheel proper is a "ring" of lead, which must be cast in a wooden mould. The essential part of the mould is shown in Fig. 4. Mark out the shape on ¾in. wood. The "waste" portion is cut out in a complete piece with a fretsaw.

CASTING THE WEIGHT

As soon as the unwanted portion has been cut away, it is put back in place again to keep the central disc and outer shape truly in position.

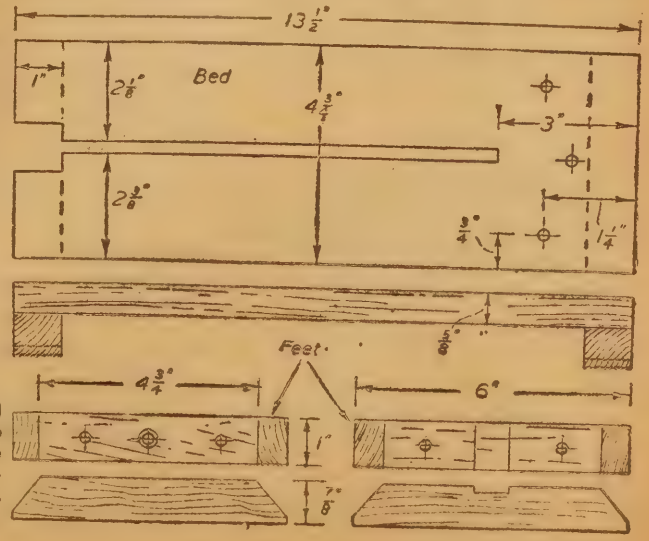


Fig. 4.—(left) Head ring mould shape, with assembly of fly wheel parts

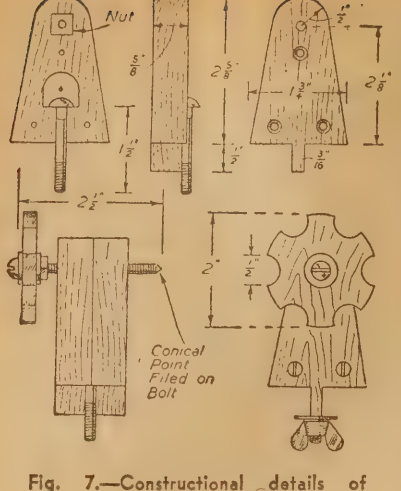


Fig. 7.—Constructional details of tail-stock.

These parts are pinned on a scrap piece of wood, then the unwanted portion lifted away. To prevent undue scorching of the wood, smoke and "air bubbles" in the molten lead, the mould needs to be sooted with a candle flame.

Once this has been done a second piece of scrap wood is put on to top off the mould to enclose it. In other words, the shape shown in Fig. 4 is "sandwiched" between two plain boards of wood, 5in. square by ½in. thick, all being nailed together; no nails must penetrate into the mould shape, of course, nor at the inlet.

Clamp the mould in a vice, with the inlet uppermost. Melt old lead pipe in an empty cocoa tin (a pouring "lip" should be bent in the rim of the tin beforehand). The molten lead must be carefully poured into the mould in a thin, steady stream until full up to the inlet hole. While the lead is burbling in the mould the latter should be "bumped" lightly on the ground to allow smoke and steam to escape. In a few minutes the lead will congeal and grow cold, following which the cast is removed. The central disc must not be taken from the casting.

It is only necessary to trim the ring of lead and drill it for the plate screws. When the plate is attached and any projection of the screw points filed level at the face side, the plywood face plate is attached, using 3-8in. by 4 flathead screws.

MAKING THE SPUR

The making and fitting of the spur to the motor spindle is the only really difficult part of the lathe. Absolute accuracy is desirable. The spur and its threaded stem is made from a 3-16in. machine bolt and a suitable winged nut.

An accurately drilled hole for a piece of bolt stem is drilled in the end of the spindle. The writer ensured central and vertical accuracy by first "popping" the spindle end with a fretwork drill point, afterwards drilling 1-16in. deep while the motor was allowed to run slowly.

A 1-16in. drill was then fitted in a hand-drill, and, still keeping the motor running slowly, the hole was bored to a depth of ½in. The drill bit, naturally, revolved much quicker than the spindle so that it "cut" into the metal easily enough, while the revolving spindle also pervented any tendency for "leaning" to one side.

The 1-16in. hole is enlarged with a 5-32in. drill, the depth remaining ½in. The threaded stem (see Fig. 3) is cut to its length (about 1 1-8in.) and filed slightly to be a force fit in the spindle hole. A conical point is filed at the opposite end; if the stem shows a tendency to "waver" while the spindle is turning, this waddling can be rectified by bending slightly with pliers the stem in the opposite direction to which it leans.

The spur, as shown in Fig. 3, is filed to shape from a winged nut. To prevent the spur from unwinding itself from its stem a "locking" nut is put on the stem first, then the spur put on and the nut tightened up against it with a spanner.

(**Note.**—In connection with conventional lathes, the driving end, called

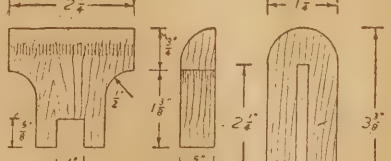


Fig. 8.—The tool rests, and details of the various parts.

the "head-stock," is at the left-hand end of the lathe bed, with the tail-stock at the right-hand end. This arrangement is not possible with the clockwork lathe because the gramophone motor spindle revolves in an anti-clockwise direction. Therefore, the driving end had, of necessity, to be placed at the right-hand side of the lathe bed; this, of course, makes no difference to the turning of wood in the lathe.)

THE LATHE BED

The lathe bed consists of a board cut to the size and shape given in Fig. 5 from 5-8in. wood and two feet cut from 7-8in. stuff, as depicted. The constructional view (Fig. 6) shows the ends to which the feet are screwed. It is imperative, by the way, that the ½in. wide slot in the bed is in alignment with the motor spindle centrally when the motor box is screwed upon the bed. A top view of the lathe bed is shown in Fig 5. The three motor-box fixing screw holes are sunk at the reverse side for flathead screws.

THE TAIL-STOCK

The tail-stock consists of tw pieces of wood which enclose by 3-16in. coach bolt and nu nut is embedded fully in on with the bolt embedded by h thickness. A suitable recess other half is made in the secon One shape is screwed to the ot three 1in. by 6 flathead screw

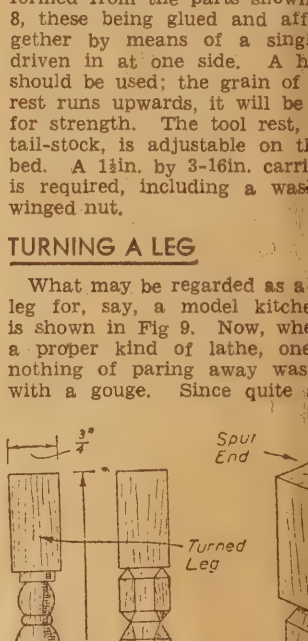
Prior to embedding the nut holes are bored in the shape (cut from 5-8in. thick wood) fo by 3-16in. machine bolt. A har for this bolt, is cut to shape f plywood; the wheel is perm attached by means of a co washers and a nut, as seen in view. A conical point is file end of the bolt. The carri requires a winged nut and wa the adjustment of the tail- the lathe bed slot, the was winged nut going to the bott of the lathe bed.

THE TOOL REST

A simple but practical tool formed from the parts shown 8, these being glued and aff gether by means of a sing driven in at one side. A h should be used; the grain of rest runs upwards, it will be for strength. The tool rest, tail-stock, is adjustable on th bed. A 1½in. by 3-16in. carri is required, including a was winged nut.

TURNING A LEG

What may be regarded as a leg for, say, a model kitche is shown in Fig 9. Now, whe a proper kind of lathe, one nothing of paring away was with a gouge. Since quite



Leg Roughly Carved With Penknife Octagonal in Section to Proposed Shape Prior to Turning on Lathe.

Fig. 9.—Example of the heavies possible on the lathe.

BUILDING A MODEL STEAM ROLLER

(Continued from Page 77)

steel rod for an axle. The axle passes through a slot which is sawn in the bottom of the frame about 2½in. from the back end. Look for this in the sketch and notice that the axle is finally held in place with a small cover strip of wood. This is necessary because the wheels are prevented from falling off by means of soldered washers. Put on plenty of solder to make a solid end. This arrangement is very strong, yet at the same time, it is free running.

THE ROLLER

The roller is attached to the front end of the frame by means of a shaped metal bracket, made from ¾in. x ¼in. mild steel. Mark out the sizes for this by trial and error after setting up the partly finished road roller on the bench. Small blocks of wood can be used to level it up. Bend the bracket to shape, drill the three holes for the screws and screw through the centre pivot to the frame. The main roller is fastened to this metal housing by means of two round headed screws. Tighten them sufficiently to prevent the roller wobbling, but allow it to run smoothly. The flywheel is also fastened to a small metal bracket made out of the same material as that used for the front bracket. Make one of these to suit the job, the general arrangement of which is clearly shown in the sketch. One end of the bracket is screwed loosely to the frame, while on the other end is fastened the free running flywheel. Solder a washer on the end of the nail axle to hold the small wheel in place. In use the flywheel rests on the road wheel and when the toy is moved about it spins around. Clean up the job with sandpaper, putty up any holes, and paint with hard drying glossy lacquer. The colors suggested are red and yellow.

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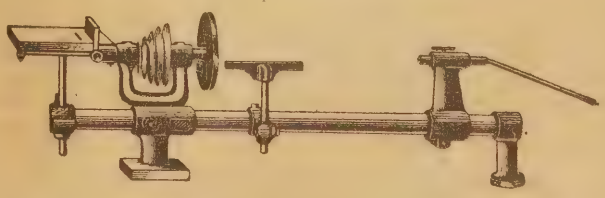

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ork-operated type is to be used maximum capacity, a great deal necessary slow "pruning" can be d by first paring the leg roughly shape with a penknife, as indiin the drawings.

paring is done "square" first, nade octagonal. If a set of four table legs are being contem-, all four are marked out and nened" up, and made ready for ing on the lathe. The ends of ood need to be centrally popped he spur end forced tightly, by against the spur so the ends in the end grain, following the tail-stock is brought up, ned to the lathe bed, and the heel turned to force the conical against the wood. To facilitate nent and prevent squeaking, a f oil should be applied to the ock point.

OR POWER

single-spring motor is only ful enough to enable light nings" to be removed at a time. notor slows up if too much pres- put upon the cutting tool. The ind of cutting tool is a keenly ned ¼in. bevelled wood-chisel. a variety of beads, flutings, s, &c., can be cut with this imnt.

turnings should be made from rod, from 1in. diameter to ¼in. er. In the case of "squared" ith turnings in or about the , the dowelling should be planed and then machined. If the is ¾in. square, the shape must ghly cut with a penknife, as ned.

is not a suitable wood for turnt splinters badly as soon as the tool loses some of its keenness. using the chisel, its back must the tool support. Its cutting gently brought forward to the ng wood to "bite" at parts re- out of true. It is a mistake w the chisel to move in and th a wobbling piece of wood; oduces an oval-shaped turning.

EASING SPEED

content with the normal high of the motor, which is somehow, the writer obtained a much "free" speed by fitting a spring pe) on the spindle of the motor r. This spring was put bethe fixed hub and sliding hub. ed to prevent the centrifugal rom acting too easily on the d springs and, consequently, ling hub. The reader must be not to use a too powerful coil this may cause the governor ve too quickly, thereby strainweighted springs and breaking

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Elizabeth St., Melbourne, C.1.

SHORT WAVE NOTES BY RAY SIMPS

REGULAR BROADCAST FROM CANADA

GOOD PROGRAMMES FROM CHOL

In our March issue we mentioned that the Canadian Broadcasting Corporation intended to conduct regular transmissions to this country and New Zealand and, as most listeners will have already noticed, these transmissions have now commenced. The first of these regular broadcasts took place on Dominion Day, June 30, when a very interesting programme was heard at excellent strength over the new outlet CHLS on 9610 kc and nearly as well on CHOL on 11720 kc.

THESE programmes are now on Sundays opening at 5.45 pm and continuing until close down at 7 pm.

Listeners' letters are answered in the first quarter hour and on the first Sunday we heard Miss Sanderson given a call. In the second Sunday broadcast there was a call for Mr. F. J. Smedley of Queensland, and also Mr. M. Krumbeck, of NSW. The writer also received a call and we were pleased to know that we had gained another "first" Australian report for our letter concerning CHLS in their initial broadcast on June 30. This gives us 94 "first" Australian veries.

Strength of these stations is really excellent with CHLS slightly stronger than CHOL at our location. Programme material is also very good and promises to provide good future entertainment.

Unfortunately our paragraph giving notice of these broadcasts was missed out of last month's issue due to lack of space but as it was published in the newspapers we feel that most people would have already known about them.

READER'S REPORTS

As our monthly station list has now been discontinued we would appreciate if listeners who are kind enough to send us reports would now confine them to reports on new stations being heard, details of verifications they have received or the reappearance of stations which have not been heard for some time. Anything of special interest, such as altered times of transmissions, changed call letters, or frequency, would, of course, also be greatly appreciated, but it will no longer be necessary to make out a long list of stations which is essentially the same every month. Please do not stop writing, but just change the make up of your reports.

OUR DX CONTEST

Quite a number of our readers have advised us that they will be entering our DX contest and no doubt many more intend to compete but have not yet let us know.

Reception conditions are particularly good at the present time and this should enable some excellent logs to be compiled and in their turn we hope, mean some fine verifications.

We have had criticism from some readers at the time allowed for the receipt of verifications and it seems that it would be advisable to extend the date when cards must be received. Accordingly will all readers please note that the date given in Rule 8 has now been changed to January 31, 1948, which will allow another two months for verifications to arrive.

Would all readers who are entering the contest, and who have not already advised us, please drop a line to the writer during the next month stating which section of the contest they will be entering and giving brief details of their receivers.

JUNIOR SECTION PRIZE

The prize for the Junior Section of the contest has been kindly donated by the well-known Sydney firm, John Martin Pty. Ltd. The exact nature of the prize will be left until nearer the end of the year to ensure that it will be something modern at the time it is presented.

STATION ADDRESSES

PASTE these additional addresses in your scrap book:

TGQA. "La Vox de Quezaltenango," Officina Departmental de Comunicaciones, Quezaltenango, Guatemala.

HJCX. "La Vox de Colombia," Apartado Postal No. 2665, Bogota Colombia.

CFVP. "The Voice of the Prairies," Toronto General Trusts Bldg., Calgary, Alberta, Canada.

WGEA-X. General Electric Co., 1 Riverroad, Schenectady, NY, USA.

CS2WI. Radio Club Portugues, Parede, Portugal.

ETA. Technical Director of Radio Services, Ministry of PTT, Addis Ababa, Ethiopia.

COBC. Radioemissora, COBC, c/o CMBC, Apartado 132, Havana, Cuba.

HP5J. Radioemissora, HP5J PO Box 34 Panama City, Panama.

ZIK2. Government Radio Station, c/o Colonial Postmaster, Belize, British Honduras.

TIPG. Radioemissora, TIPG, Apartado 225, San Jose, Costa Rica.

RADIO SAIGON IS AN OLD FRIEND

RADIO SAIGON has been a well-known station to the majority of Australian listeners for many years now and the following details, which we have recently received direct from the station, will no doubt be of interest to many.

"Radio Saigon is owned and operated by Direction Federale de l'Information et du Tourisme, that is to say, that this station runs under official control. Studios are located in Saigon 193 Rue Chasseloup, Laubat. These are emergency studios, former ones having been completely destroyed by the explosion of an arsenal on April 8, 1946. The audio freqency equipment of these emergency studios is composed of a 7-tube mixer line amplifier, 2 dynamic microphones 2 turntables and magnetic pickups and one Monitoring amplifier, quite simple as you can see. The more elaborate design in these studios are the microphone relays and announcers' warning system, working on 12 volt batteries.

The line amplifier injects modulation in a 500 ohm matched telephone line, which conducts us to Phu-Tho, an Annamise village some four miles from Saigon, where the transmitters are located. These transmitters radiate on the following frequencies 11.78, 6.19, and 1.05 megacycles. (Note 6.19 now changed to 6.165mc.). Here is the technical data for each rig: 11.78mc. transmitter; output power, 12,000 watts; input power, 50,000 watts; radio frequency final amplifier tubes—2/10kw. 1651 water-cooled anode voltage 9000 volts, filaments 16 volts 50 amperes. Antenna—Square, non-directive. 6.19mc. transmitter: Output power 12,000 watts, input power 50,000 watts. Radio frequency final amplifier tubes, 2-10 kilowattts, 1651 water cooled. Modulation—Heising. Antenna—Doublet, non-directive, and finally details of the 1.05mc. transmitter which operates only locally. Output power 1500 watts input power 5000 watts; radio frequency final amplifier tubes, 2—E956, one kilowatt air-cooled; modulation—Heising, Antenna—Prismatic.

We hope to have some interesting news soon from this station concerning a special broadcast for "Radio and Hobbies" readers and may have details by next month's issue.

NEW STATIO

PERU: Quite good reception h tained from two Peruvian station 50 metres, details of which are a OAX4V, 5907kc., "Radio Americ in Lima. This one seems to c air around 10.15 pm and dan are given till around 11 pm. A they give three calls, OAX4U, OAX4W (incidentally the latter c at the same time on 9390kc.), one is OAX4Z on 5895kc., also i opens at 10.45 pm with a mar by call letters and slogan "Rad del Peru." A lady then condu exercises, accompanied by piano, when news is given. No Engli by either of the above but the easily be understood.

GUATEMALA: A new Guatem has been beard in TGOA, which 6102kc. (this is the exact me quency) and can be heard openi pm. After station announcemen TGO onda larga and TGOA "La Vox de las Americas," the gious numbers until around 11 Cushen heard this one about the as we did but in his case it afternoon until their sign-off at have tried for it at this time luck, but listeners should easily night if they tune slightly lo quency than HJFK, which is stil 10.30 pm.

INDO-CHINA: Ern Moore in Br tioned a station he was hearing every night and which signed Marseillaise but whose identity not establish. After some caref we have identified it as "Radio Hanoi. It comes on the air just with native type programme un followed by French with lady ann then at 10 pm play "Beer Ba with announcement in English by is Radio France, Hanoi, and the quency, which sounds like 9520k are definitely on 9465kc. just be station WET, which is on 9470k session of news and records concl 10.20 pm. Music is fair quality very poor.

BRAZIL: The Brazilian station heard very well just now and w logged another new one, ZYB8 which can be heard from around is still quite understandable a though becoming weak at that use three chimes and carry advertising programme and this be heard quite often in their ments. At the half-hour and they give their slogan, Radio Sa this is where they are located. culty should be had in hearin even though it is all in Spani are just slightly higher in fre CKRA, which can also be heard

PALESTINE: A very interestin tation has recently been logged this being the Forces' Broadcas in Jerusalem. They announce "You are tuned to the Forces' ng Station, Jerusalem, in a te ion on 7.25mc., 41.37m." They are on the air from 1700 to 21 Wednesday and from 1700 to 23 Mondays and Fridays. On July them very well from just befor after 8.30 am, Sydney time. answered at 5 am and then the gramme resume. Reception rep quested, giving signal strength, l and they give address as No. 1 Fo Unit, Jerusalem, MEOF. This is so go after it.

RADIO SAIGON: On July 7 w prised to find Radio Saigon ope new frequency in the 48-metre b 6165kc., instead of the old f 6190kc. Strength on this new very much better than the form it seemed as if they were usi power as their 11,780kc. outlet w ing in at higher level.

MOZAMBIQUE: We were very s morning recently to log CR7AE quency of 6980kc. around 7 a discovered that this was an their fundamental frequency of tuning to that frequency there of them but on 6980kc. they co followed.

ASHES FROM VERYWHERE

ZERLAND.—The Swiss stations appear ppular with all Australian short-wave mainly due I suppose to the excel- nals they put into this country in metre band in the late afternoons. tion now of course, they can be n their North American programme the 19 and 25 metre bands around me daily.

hose listeners who follow the sun cle, an interesting session can be nce a month when this station gives nth's relative sun spot figures as at the Berne Observatory. The or May were very interesting reach- on one day.

AFRICA.—We have recently re- late copy of the South African ting Corporation's weekly magazine, Week," and from it we note that rizburg is listed as being on the air m 4.45 am till 6 am on a frequency c. Readers should also note that burg now operates on 9870kc. instead old frequency of 9912kc. When the ecently verified our report of Feb- last they stated that they had to this frequency early in that d we have logged them recently till at 2.10 am though the signal is k.

TINA.—We learn from the latest "Radio News" that two Swedes have ed broadcasts from a 50 watt station Buenos Aires, using the call letters d BARE, on frequencies of 6950kc, 2kc. Their operating schedule is till midnight, and 8 am till 9 am. e should manage to log these the address is, "Gustaf Gullander," lander, Balcare 353 Buenos Aires . These are really two hard ones, will be first to report reception.

Belgrano, using LRY on 9455kc. I on 11880kc., are now reported to ing in parallel until around 7 am. her frequency can be logged quite now.

From the same publication we learn lo Tabriz has now added English to of languages used and is heard at in a 10-minute session followed by ne records. The frequencies used e transmissions are 6087kc. and This station is apparently anxious e reports of reception and these addressed to Radio Tabriz, Tabriz, ch is evidently the full address, as ll that is shown in their letter of n.

station in this country, EPB on has again been logged around 9.30 strength of signal is very weak at . The transmission on 6155kc. is the very early morning.

ND.—We recently received a very r from the Chief Engineer of the g us that our short wave notes are thing he reads when he receives his Radio and Hobbies." He also draws ition to a slight mistake in our Solar Activity in the April issue. tely through a misprint 28mc. was a frequency which the BBC would use more frequently in the future. course, should have been 26mc. ng on the interesting phase of the un spot cycle which we are now hrough, Mr. Phillips tells us that Television Service has been heard wn, Johannesburg, and various other South Africa.

AD.—From the DX session over stralia we learn of a new station Vest Indian colony which has re- gun operations. This new one is located in Port of Spain and on 9635kc., and also we believe, . It has been heard in the USA n till 9.20 pm, and has also been t 11.15 am. These transmissions are nature and it is expected the ll begin regular broadcasts about Reports of reception would be d and should be sent to the station asting House, Port of Spain, Trini- ll be hard to hear this one at the tioned but it may break through on e day.

NEW STATION LOGGINGS

Call	Kc.	Wl.	Location.	Time heard.
NAIROBI	4855	61.79	Nairobi, Kenya	5.00 am
OAX4Z	5895	50.89	Lima, Peru	10.45 pm
OAX4V	5910	50.76	Lima, Peru	10.30 pm
TGOA	6102	49.16	Guatemala City, Guat.	10.30 pm
SINGAPORE	6120	49.02	Singapore, Malaya	9.30 pm
SAIGON	6165	48.66	Saigon, Indo China	9.00 pm
No. 1 F.B.S.	7250	41.37	Jerusalem, Palestine	6.00 am
Radio FRANCE	9465	31.70	Hanoi, Indo China	9.30 pm
CHLS	9610	31.22	Montreal, Canada	5.45 pm
VLB10	11740	25.55	Shepparton, Vic.	9.00 pm
ZYB8	11765	25.50	Sao Paulo, Brazil	8.00 am
XGOY	15170	19.78	Chunking, China	10.45 pm
XGOA	15350	19.54	Nanking, China	7.00 pm
VLA7	17800	16.85	Shepparton, Vic.	10.00 am

THIS MONTH'S VERIFICATIONS

ZQI JAMAICA.—One of the writer's best verifications arrived during this past month, being a very attractive card and interesting letter from ZQI in Kingston, Jamaica, in answer to our report on their cricket broadcast. The card is pale yellow with large call letters in black, with a red stroke of lightning through them. On the reverse side are the verification details and they state they will welcome future comments on signal strength, stability and quality. In the covering letter, the Station Manager, Mr. Denis M. Glick, advised us that ours was their first report from Australia they had been able to verify, so this one now adds another first to the one we received from VRR5.

SAIGON.—After waiting for many months we have at last received a verification letter from Radio Saigon on their 6190kc. transmission. They explained that they were unable to verify our report of their 4810kc. broadcast as all their documents had been burned when they had the explosion at their station. They sent along some quite interesting information about the station which we hope to include in this issue if we can find room and also a request that we consider having a special programme dedicated to "Radio and Hobbies." We hope to have more to say on this matter in the near future. They also advised that our report on 6190kc. was the first they had received from Australia.

SHORT wave notes for the September issue of "Radio & Hobbies" are due on August 9. In the October issue they are due on September 6. Please send them direct to Mr. Ray Simpson, 80 Wilga Street, CONCORD WEST. NSW.

YV5RM, VENEZUELA. — South American verifications are always very interesting when they arrive and we were therefore especially pleased to receive an attractive card from YV5RM, "Radio Venezuela," Caracas, verifying our report on their 4970kc. transmission. The card is quite a large one and shows their call letters, and also on the left is an illustration of a microphone. Verification details are all in Spanish, but it is quite easy to understand. Although the card was sent by air mail it took a very long time to arrive, so we think it must have come by ship mail, despite the air mail marking.

ZQP, NORTHERN RHODESIA. — We were pleased to receive a verification card for our 129th country in the shape of a rather attractive black and white card from ZQP in Lusaka, Northern Rhodesia, verifying our reception of their signals on 9710kc. The card has call letters in large type at the top of the design which comprises a map of Africa with what we take to be the Colony badge in the centre, with a scroll round it with the words "Lusaka, Northern Rhodesia." They state in the verification details that they will be glad to hear from us again, the address being Information Officer, PO Box 209, Lusaka, Northern Rhodesia.

SUDAN.—We are indebted to Mr. Colin W. Jones, of Gladesville, for details of a very nice verification he recently received from the Omdurman Broadcasting Station. In their letter they state that they have an English programme on Saturday mornings only, from 3.30 am till 4 am on both 9650kc. and also on 13320kc. The power of these stations is 450 watts and 250 watts respectively. Further reports on these stations should be sent to the following address: Mr. H. H. Finch-Dawson, Broadcasting Officer Omdurman Broadcasting Station, Public Relations Office, PO Box 282, Khartoum, Sudan.

NAIROBI. — Verification received from Nairobi is the usual form letter filled in regarding the report received with the additional notation that ours was their first report from Australia for this frequency of 4885kc., and stating that they no longer used 10730kc. Incidentally, readers should note that this station is now using 4855kc. and not 4885kc. or 4950kc., which seems to be the one quoted in most magazines.

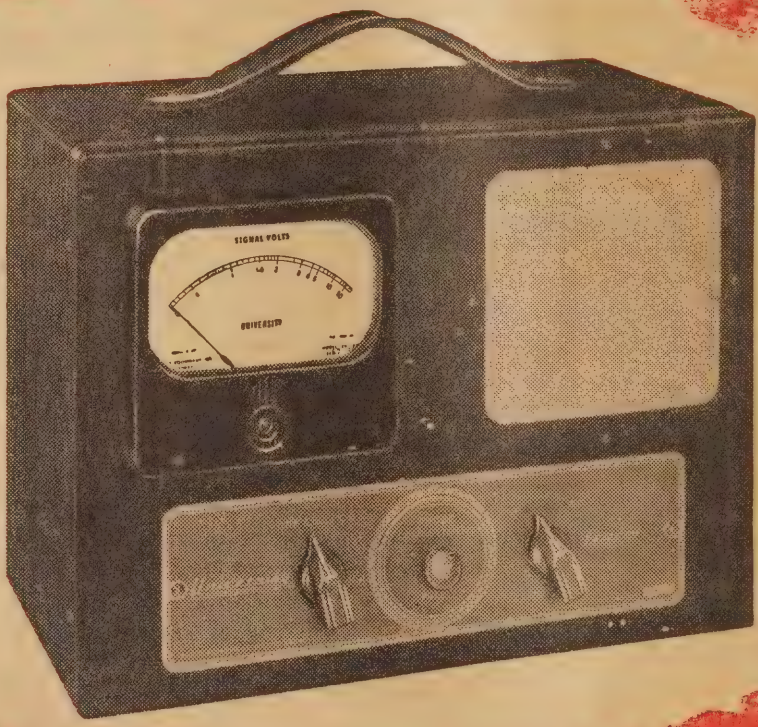
ZTJ. SOUTH AFRICA.—The usual yellow card was received for this station, verifying our report on their 9870kc. transmission and, incidentally, this was another "first" for us. Mr. Jones of Gladesville, has also received a nice letter and copy of "Radio Week" from the SBC.

FHE2, DAKAR.—Our first report to Dakar was sent in February, 1942, followed up by three others up till last December when we sent them a report on FHE2, on 15390kc. Although our last three letters were sent by registered mail we have only just received our verification, which fortunately verifies both this station and also the two others, FHE3 on 11715kc. and FGA7, 9410kc., the latter being the one heard in 1942. Their card is printed in English, in black and red and shows a map of Africa together with the heading, "Verification of Reception." The only address given is Radio Dakar, Dakar, French West Africa. This card makes our total of countries verified 130, so it was well worth waiting for.

VJLQ, "HALGARD."—One of our most interesting verifications is one we received from VJLQ, the trawler "Halgard," which we heard one day on 6280kc. when they were calling Sydney to advise that they had broken down about 30 miles off the coast. The owner was most appreciative of our passing on this message to the Navigation authorities and sent a very nice letter of verification. Two other recent Australians are for VLC on 15200kc. and VLB10 on 11740kc. Both these station are now being used regularly as also is VLC8 on 7280kc., opening at 3.45 am if anyone cares to get up that early to log them.

NEW.. FAST..

The University



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It's a Signal Tracer—the most versatile and foolproof instrument that has ever been designed for speedy and economical radio service work and general fault finding. It is something that has been talked about for many years but has never before appeared on the Australian market. Portable—light—sturdily constructed—it has a host of advantages all of which appeal to the serviceman, the amateur set builder and the experimenter. It is built into an attractive brocaded steel case with a leather carrying handle and all the necessary test leads and instructions are supplied. It embodies one of the famous "University" four inch square meters together with a new 3½in. permagnetic speaker. Standard type easily replaceable batteries are built internally and a book of instructions explains the uses and shows how signal tracing is the latest up-to-date method of service work. Signal tracing is carried out both by ear and by eye. You hear the signal in the speaker—and you see the signal on the meter. This is the post-war service instrument—one that is simple to use, foolproof, speedy, portable, economical and right up to the minute. You've waited a long time for it and here it is!

WHAT IT DOES:

Spearhead of this most efficient instrument is the probe. This is a bakelite moulding into which is built one of the new bantam type valves. There is practically no pre-setting and adjusting to be done on the instrument itself. You merely take the probe and trace through the receiver under test and watch the indications on the meter or listen to the indications on the speaker and presto!—the fault is found that way. It actually traces the path of the signal RIGHT THROUGH the radio receiver from start to finish. It can be used just as effectively on amplifiers or intercommunication systems and will give the same effectiveness and speedy service. It makes fault finding in radio receivers, etc. easy and quick. When the probe strikes the faulty section, indications are given by the meter and speaker both. It will indicate clearly and easily faults in coils, condensers, intermediate frequency transformers, components, as the signal is traced. It makes service work sure and certain. This is the instrument you must have—a necessity in every place where radio work is being done. Quantities are limited, so place your order early. Ask for model S.T.B. "University" Signal Tracer.

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CENTRAL AMERICANS NOW HEARD

INCLUDING MEXICAN STATIONS

OUR summary of the South American stations in last month's issue appears to have been very popular and as promised, we now treat the Central Americans in a similar manner and include also Mexico, as this country is in the same group, as also are the West Indians.

MEXICO.—Some excellent signals are now audible from this country and at our location pride of place must be given to XEHH on 11880kc., which comes in at really excellent strength on a Sunday afternoon till 4 pm. Although their call is given in Spanish it is easily understood as it is given slowly, XERH onda larga and XEHH onda corta. A real old timer, XEWW on 9500kc., can still be heard every night around 11 pm; and also in the late afternoons.

Another Mexican which has been heard over a number of years, is XEQQ on 9680kc., which can also be heard nightly. Others now audible are XENN on 11780kc. in the early forenoon, and XEBT on 9625kc., sometimes heard opening at 11 pm, but usually better in late afternoons. Another good one at night is XETW on 6045kc. in Tampico which opens at 9.30 pm and holds out till after 10 pm. A Mexican which we have not heard for some considerable time is XEBR on 11820kc., audible on a recent Sunday afternoon around 2.30 pm. Listeners who have not had any success with Mexicans in the past should try for some of the above as we know them all to verify, with the exception of XENN and XETW, which we have not received.

PANAMA.—Panamanian stations have always been heard fairly well in this country and a few months ago we had a new one in HOXA on 15100kc., and also its sister station, HOXB on 11810kc. The former outlet has not been heard at our location just recently but will no doubt show up again soon. As we write these notes we are listening to HP5A on 11695kc. around 10.30 pm, and although it is weak, it can easily be recognised. A few weeks ago we had the special broadcast from HP5B on 6030kc. around 5 pm on Sundays, while most nights one can hear HP5J on 9607kc. from about 10 pm. Another good one is HP5H on 6122kc., often heard opening at 9 pm, while a few months ago HOA on 6170kc. was sometimes heard. Try to log HOLA on 9505kc., which so far has eluded us when it opens at 8 am.

GUATEMALA.—The most widely heard of the Guatemalan stations is undoubtedly TGWA on 9760kc., which can always be heard on Sundays with their typical Marimba music around 2.30 pm. They are also sometimes heard at night through TG2 on 6620kc., which opens at 10.30 pm, and also the new one, TGOA on 6102kc. opening at the same time. A few weeks ago we were also hearing TGWA in the 19 metre band on 15170kc., opening at midnight, but it has been inaudible now for over a week, so may have discontinued the use of this channel. TGWB was logged by some listeners about this time last year, so it may be advisable to tune to 6535kc. around 10.30 pm, where it may again be heard. All the above stations are located in Guatemala City.

HAITI.—There are not many stations in this country, but one which many listeners have heard is HH3W on 10135kc., which being a clear channel, makes identification easier. Quite an amount of French is used from this West Indian, which also aids identification. HHCM on 6165kc. seems to be very irregular and before Saigon used this channel it could sometimes be heard from opening at 9.35 pm. The only other Haiti station we have logged is HHBM on 9660kc. at the same time as HHCM, but on this channel these days it would be nearly impossible to tune it in. Port-au-Prince, the capital, is the location of all these stations and they are all known to verify.

CUBA.—The Cubans have always been amongst the easiest of the West Indians to log and over the past few years we have verified 23 of them on various frequencies. The most consistent these days is COCX on 9270kc., nightly around 11 pm, and COHI on 6455kc., closing with English announcement at 4 pm Sundays. Others which can sometimes be logged are COBL, 9835kc., at 11 pm, CORG in Santiago, on 8955kc. is weak but clearly heard at 10.30 pm, as also is COCQ on 8825kc., located in Havana. On Sunday afternoons there is often quite a good signal from COBC, using the 9363kc. channel, while very infrequently we hear COCO on 8695kc. and COBZ on 9026kc., always around 10.30 pm. All the above stations verify so reports are well worth while.

OTHER COUNTRIES. — There are not enough stations heard from the other countries in this group to treat separately so we will group them all in this one paragraph.

Costa Rica only gives us one station these days, being TIPG on 9615kc., "La Vox de la Victor," and occasionally heard at good strength just after 10 pm. Rather a good one is HRN on 5875kc., located in Tegucigalpa, the capital of Honduras. We always consider this to be about our best verification as it is a station which only seems to verify about every hundredth report received, or so the American radio magazines used to say. We were therefore very interested to hear it again recently at 10.30 pm, weak but easily identified.

The Dominican Republic has always been a hard country to log though a few years ago we managed to verify HIX on two frequencies, HI2X, HI3X on two frequencies, HIN, HI1J, and HI3U, though these days the only ones we hear are HI1Z on 6315kc., on some Sundays around 9.30 pm, and more recently still, HI2G on 9223kc. also on a Sunday just after 2 pm. These latter two stations are located in the capital of the country, Ciudad Trujillo. The only other ones from this part of the globe are the two Jamaicans, ZQI and VRR5, which we reported a couple of months ago in the cricket broadcast.

Next month we will give a summary of the African stations and after that whatever continent most listeners request, so please let us know in your next letter.

READERS' REPORTS AND VERIFICATIONS

LETTERS and reports have been received from the following readers during the past month.

Mr. M. Foster, Mount Vincent, NSW; Mr. J. Jensen, Bankstown, NSW; Mr. J. W. Day, Caboolture, Qld.; Mr. H. R. Cox, Cobden, NZ; Radio Australia, Melbourne, Vic.; Mr. G. J. S. Hepburn, Croydon, NSW; Mr. A. Cushen, Invercargill, NZ; Mr. A. E. Major, Manjimup, WA; Mr. C. W. Jones, Gladesville, NSW; Mr. M. Krumbeck, Carlton, NSW; Mr. J. Wiseman, Kew, Vic.; Mr. R. Holland, Canterbury, Vic.; Mr. F. J. Smedley, Landsborough, Qld.; Mr. R. Block, Petersham, NSW; Mr. P. Kayser, West End, Qld.; Mr. E. Moore, Brisbane, Qld.; Mr. J. Saunders, Bondi Beach, NSW; Miss D. Sanderson, Malvern, Vic.; Mr. A. Lee, Merewether, NSW.

VERIFICATIONS RECEIVED

THE following readers have received verifications confirming their reception of various short-wave stations.

Mr. R. Block. Singapore, Noumea, VLW3-7, KZPI, KRHO 17,800kc., WGEA 15,330kc., WRUA 9570kc., PCJ, HE15, VUD10 17,830kc., VUD5 15,190kc., VUD9.

Mr. J. Saunders. PCJ 9590kc., VUD10, HER5, XGOA 11,835kc., WRUL 15,290kc., WRUS-A 15,130kc., KRHO 17,800kc., Singapore 15,275kc., 15,300kc., KGEX 11,730kc., WRCA 11,890kc., KGEI 15,130kc., KWID 11,900kc., VLA6, VLB, VLB6, VLB4-5-8, VLC4-7-7-9-11, VLG6-7-10, VLH3-5, FZI.

Mr. F. J. Smedley. CKLO, KZPI, FZI 17,530kc., HE15, WNRA 18,160kc., WNRI 13,050kc., WNRE 15,280kc., WNBI 17,750kc., TAP, VJZ, VLB, VLA5, VLC7.

Mr. R. Holland. VLR2, VLG5, VLC7, VLC9, VLG10, VLH3.

Mr. J. Wiseman. SEAC 6075kc., 15,120kc., CKLO, KWID 9570kc VLG10.

Mr. M. Krumbeck. TAP, Radio Malaya 4820kc., VUD10 17,830kc., VUD5 15,190kc., KZPI, SEAC 17,770kc.

Mr. C. W. Jones. KZPI, Algiers, VLW7, Macau, Noumea, Suva, XGOY, Omdurman, WLWO, PCJ.

Mr. A. Cushen. Macassar 9250kc., CR7AB, Algiers 6025kc., 9540kc., WLWS 11,710kc.

Mr. J. S. Hepburn. PCJ, Swiss, KU5Q.

Mr. J. W. Day. HER5, VLG5, VLB9, VLC4, VLC9.

Mr. J. Jensen. SEAC 15,120kc.

Miss D. Sanderson. ZAA, XGOA 9730kc.

Our Own Listening Post. Saigon 6190kc. (first report from Australia), VJLQ 6280kc., VLC, VLB10, CKLX, CKCS, PGD, XGOY 9640kc., 9658kc., WCDA 15,270kc. (first report from Australia), FZI 15,595kc., YV5RM, CKRZ 6060kc. (first report from Australia), ZQP 9710kc., VUD2 9680kc., ZQI 4700kc. (first report from Australia), FHE2 15,390kc., FGA 11,715kc., CHLS 9610kc. (first report from Australia).

SEAC RADI
TIMES

In a previous issue we mentio interesting monthly magazine by the Forces Broadcasting Sta Colombo, Ceylon and in addi the programme details there a number of articles dealing w personnel attached to the stati their activities in preparing t gramme material. Some of t toons are also very humorous typical examples of the accep pression of BBC announcers

THERE is also usually an article chief engineer of the station, Blakemore, and the one in the Ju is of sufficient interest to warra ing, as it answers a question wh comes up in discussing short-wav missions.

Here is the article in question—

"A few weeks ago a listener w asked why it was necessary to u power transmitters on short-wave when the amateurs established st standing world-wide radio telephone with a very few watts.

"The answer is now quite clear, as a result of recent observation high and low power circuit from the UK.

"As you may already know, w special UK transmission, using th set every Sunday evening, and th mission is monitored and checked BBC and details are reported bac These reports show that provided frequency changes are made, re consistent results can be obtained the fact that it is not possible optimum working frequencies as much too high just now.

RELIABILITY

"On the other hand, the amateu VS7FF, which uses some 35 to 5 has also established many remarka tacts with the UK, but these con always subject to complete fade- if conditions are not favorable power channel may be completel down. The close-down on the U is sometimes quite complete, ir of the fact that beamed aerials and a very much wider selection quencies is available.

"Here then is the reason for h transmissions (80kw. or over) to consistent and reliable programme almost irrespective minor ic changes. Medium-power transmissio about 20kw., are subject to varia over 50kw., results appear to be m reliable, and during the past year compelte 'fade-out' has been reporte high-power channel."

The above observations by Mr more cover this point very well a explain why it is not a waste of use kilowatts when some listeners m that watts would do just as goo There is no doubt that there h some remarkable contacts made o tionally low power and many amateurs have been heard to expres ment that Australian amateur signa reach the States at such great when only using a fraction of t they are using over there.

STOP PRESS ITE

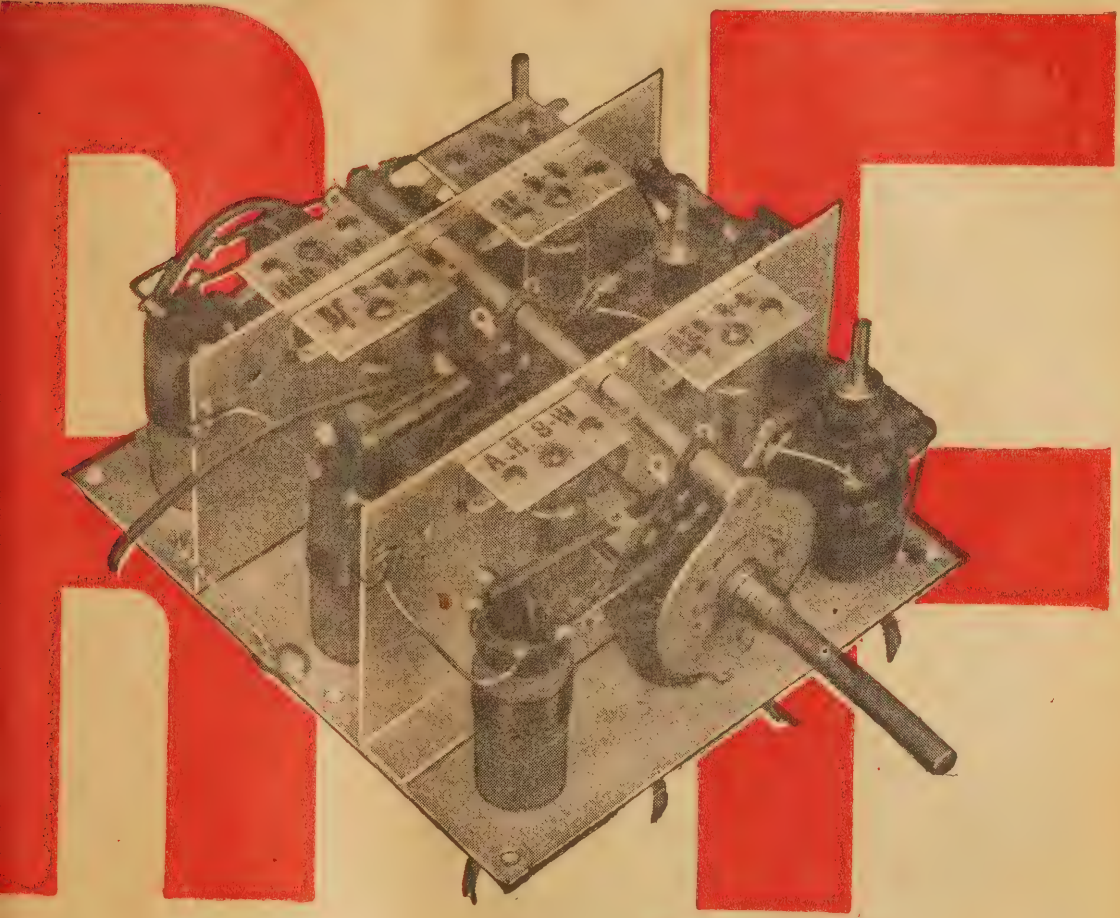
STILL another of the Radio Aust jets has been taken into use, being VLA7 on 17,800kc. It was on July 14 in the transmission o 10 am. The only other VLA outlet taken into use is VLA2 on 9520kc.

ON recent Sunday afternoons heard a Chilean station on 7270 ing the same programme as CE1190. it is another outlet of the same another in relay we cannot say by next issue to have further det station remains on the air until 3 it closes with a march.

WE were surprised to be able t the Johannesburg station on frequency and the programme ca lowed from around 6.30 am til closes at 7.5 am. At 6.45 am the is given, followed by announce Afrikaans around 7 am, and sta closes with God Save the King.

; Used in Radio & Hobbies

47 SENIOR RADIOGRAM



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THE HAM BANDS WITH BILL MOOR

A recent cable appearing in the local Press stated that 100,000 hams would transmit throughout the world news of the United Nations work and activities. Full information covering this Press statement has come to hand.

GEORGE W. BAILEY, W2KH, president of the International Amateur Radio Union and the ARRL, signed, on behalf of world's amateurs, an agreement with UNO, along the following lines:—The IARU, whose constituent societies have a membership of approximately 100,000 amateurs throughout the world, many of whom are in daily contact with one another, is recognised by the United Nations as being in a position to render service to the UN as a distributing agency for material issued by UN for the peoples of the world.

Each amateur radio operator member of a society affiliated with the union is licensed, under the rules and regulations established by his own Government, to operate transmitting and receiving equipment now. Therefore, in recognition of the great potential value to the United Nations and its special activities, an agreement is hereby entered into, which will permit the fullest possible use of the aforementioned communication facilities.

The purpose of this association is to promote the point-to-point or person-to-person communication carrying approved UN material. The association will also provide a means of obtaining information concerning reception of UN broadcasts throughout the world. The amateurs will handle only that type of written material which would not otherwise be handled by international commercial facilities, such dissemination and collection of information being without prejudice to the amateur code of serving without pecuniary interest.

The American stations will during their DX contacts pass on news of UN activity. It is work in which every amateur can participate, providing the local authorities agree. It is proposed that the whole set-up be arranged through the IARU societies (WIA in Australia, NZART in NZ), and monitors and critics will be appointed to report on UN DPI broadcasts. It is proposed to establish a powerful amateur station at UN HQ at Lake Success.

The whole move politically is one of great importance to the amateur and undoubtedly the agreement will have some bearing on the ultimate outcome of the Atlantic City conference dealings with amateur affairs.

Most of the hopes of the world rest in UN and anything the ham fraternity can do to foster such hopes will be work well done.

NEW REGULATIONS

MOST amateurs are standing by, to learn the final details of the proposed new regulations foreshadowed in a statement by the Postmaster-General, Senator Cameron, who said: "Most amateur stations will be allowed to use increased power shortly and to use frequency modulation and pulse transmissions on selected frequencies." The PMG also stated that the department will recognise the fine war record of the Australian amateur.

The Federal executive of the WIA anticipates that more liberal regulations covering amateur stations would be issued in the next few weeks. The gazetting of these regulations will be the culmination of the efforts of the Federal executive of the W worked hard during the past year t these privileges for the Australian

ATLANTIC CITY

NO definite news affecting amate has come to hand from Atlan at the date of writing (July 14 American stations contacted during few days couldn't raise a decent rum last official news from the ARRL end of June contained the followin Allocation work with many sub-co is proceeding but no decisions amateur radio have as yet been Nations are divided on the 7mc. b great pressure is being exerted by terests against amateur allocations frequency.

A sub-committee of 12 nations a proposed band at 21mc. unanimou and suggested to the full conference wide band at 21mc. This sub-co decision should help and improve of an allocation at this frequency. C action on amateur requirements can pected shortly.

Private information coming throu various sources supports the inform the bulletin, "Amateur Service" h defined. This definition covers ger structions to Governments on the use ship and traffic handling limita amateur stations.

Apparently the British Empire gr cluding Australia, is against any allocation between 7200 and 7300 in Australia haven't had the use frequencies since Cairo). The US d is fighting for the retention of the to 7300 band.

The Russians, from reports, are r ing much attempt to assist amat quency demands in any way.

Two early proposals submitted ca Czechoslovakia and Eire. The fir suggested SW broadcasting bands mence at 7.1 and 21.35 megacycl would also generally cut up VHF al at the moment held for exclusive use.

Eire proposed no specific amateu tions, but pressed for extended SW vices.

Although the RSGB hoped the U modify her proposals, the origina still stand. They are—3.5 to 3.6, 7 14.0 to 14.4 and 28 to 29.7 megacycl

For those nations supporting radio, the fight is really on.

N.S.W. AMATEUR STATIONS ON 50 MC.

SIX METRE STATIONS

2ZN	50.001	2LS
2JU	50.112	2AEX
2JX	50.12	2TR
2AHF	50.16	2NP
2DN	50.25	2VN
2NO	50.4	2LY
2ABZ	50.6	2LZ
2EM	50.7	2FO
2BG	50.8	2AFE
2ALO	50.94	2ABC
2AZ	50.96	2AFO
2XV	51.0	2WJ
2YQ	51.14	2DF
2MQ	51.15	2AHG
2QG	51.246	2IQ

166 MC. STATIONS

2FK	2ABZ
2KI	2AEE
2LY	(169.7 xtal)
2LZ	2AGL
2NP	2AHF
2NQ	2AHG
2PW	2ALG
2VS	2ALO
2WJ	2ALU

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6MX

who left recently for Tonga, was
d with 6MX gear. Some interest-
ith him were conducted by 2NO

M. M call, VE7ALG (as a G port-
n't use 50 megs.), he was con-
five hours on the trip east from
inal QSO was made at about 50
n the Tasman. He was reported
Apia, using call sign G5UB/P

x 2GC had a day out on 6MX
June 22. Arthur contacted ten
received mostly R9 reports. The
branch of the CSIR predicted
would be open for 1000-mile con-
g late June and early July. This
was proved to be correct when
's were again reported on Sunday,
gain on July 6 the band was open
n Millmerran received R9 reports
4SN, operating portable on Tam-
nts, also broke through with low
N is repeating the portable work
Macpherson Ranges on Saturday,
d any reports of reception would
ted by him.

OM THUMB

ontinued from Page 33)

nding. Another spot of wax
he turns tight, reconnection
ose end to the connecting
the reaction circuit worked
arm.

find, therefore, that your re-
es not oscillate evenly over
band, we suggest you follow
procedure. If you do happen
he turns in the wrong direc-
will simply counteract the
inding and the reaction may
altogether. The remedy is to
turns on again in the oppo-
ion.

EAKER

final word about the use of
or loudspeaker. We found
could obtain loudspeaker re-
all Sydney stations, but this
good average reception area.
e poor reception areas, and

construction of "Tom Thumb"
nakes the preparation of a
r wiring diagram almost im-
le. In its place, we have
on pages 29 and 31 detail-
hotographs of the actual
r, together with an exact
yout of the chassis and panel.
hese, no one should have any
in putting together this
grand little job.

alongside broadcast stations
same results could not be

not-too-remote country areas
er reception may be possible
two of the stronger stations
od aerial and earth, but ear-
uld be preferable for general
For complete compactness
arphone could be used, pre-
the high impedance type.
hen, is the story of "Tom
cheeky little fellow with a
and a loud voice.

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OFF THE RECORD — NEWS & REVIEW

The first three sets of records reviewed this month provide a good opportunity to c
pare three approaches to Mozart. We have Claudio Arrau, an outstanding figure amo
the younger pianists, Artur Schnabel, the mature artist, and a famous woman, Lili Kr

By JOHN MOYLE

Claudio Arrau (piano)—Sonata in G Major K283, and Sonata in D Major K577 (Mozart). HMV. ED.493-495.

Claudio Arrau's worth as a pianist, as indicated by his first recordings, has been amply justified by his recitals. An indication of his musical resources was given in his recent "Carnival Suite."

These two Mozart sonatas, both well known, illustrate his ability to subdue his natural fire to the lighter touch of more delicate music.

They are both beautifully played. This is a young man's approach. I feel there is yet more in Mozart to be found than Arrau brings out. Good as the performance undoubtedly is, I think he will play better than this before he is done. My remarks are more as a compliment to the future than a criticism of the present. You will enjoy every minute of these records. Technically they are good average.

ARTUR SCHNABEL, Pianist—"Rondo No. 2 in A Minor, K511" (Mozart). HMV ED.490.

As a tremendous contrast to Arrau, Schnabel invests this rondo with just about as much as it will stand. Play it through and you will better appreciate my comments on the younger man. It is an interesting comparison, because more than one well-informed musician has mentioned to me both men in the same breath.

At any rate, here is typical Schnabel, with all his power, vitality and background. His playing is stamped always with masculinity and maturity.

The stature of Schnabel is something that will grow with time. Few artists alive today can produce work which can be studied as masterpieces. Not one, but nearly all his records can stand this test. In them we can observe his mind at work and realise the plane upon which it operates. He is one of the gramophone's mightiest figures.

KRAUS AND MOZART

LILI KRAUS, Pianist—"Fantasia and Sonata for Pianoforte in C Minor," K475 and 457 (Mozart). PARLOPHONE AR.1129-32.

A third Mozart player whose last Australian visit is remembered with great pleasure is Lili Kraus. Her performance of the Fantasia and Sonata presents yet another viewpoint on Mozart.

Technically these are the best of the three Mozart sets. They show really good tone, and are typical of other excellent records by this lady.

It is a long piano work for Mozart, and appears somewhat loosely put together. This in itself presents difficulties, particularly as the pianiste's musical focus appears by nature to be more in what she is playing than in what she is about to play.

There are more sober moments here than we usually find in Mozart—almost a hint of something which the later Beethoven was so much better equipped to say. But, on the whole, the music demands but little, and you will thoroughly enjoy the sensitive and warm artistry which are so evident.

A MASTER VIOLINIST

ISAAC STERN, Violinist—Concert in D Minor, Op. 22 (Wieniawski) with the Philharmonic Symphony Orchestra of New York, conducted by Efrem Kurtz. COLUMBIA LOX.6024-6.

You will require only a few bars of this concerto to convince you that the term "master violinist" is not applied lightly to Isaac Stern. The music itself is of the Mendelssohn type, charming and easy to hear.

It is best known for the lovely little slow movement frequently played with piano accompaniment.

It also contains some passages which demand quite heavily on a performer's equipment.

To Stern, all these things are there merely to be played. He surmounts them with the complete confidence and ease of a master.

But, more than this, he has that complete unity with and feeling for his instrument which is given to few.

To this music he gives just the right touch of wistfulness, of artless happiness, with no attempt to plumb depths which just are not there.

By so doing he avoids the touch of stickiness so often ladled out with this work. Even in the famous slow movement his judgment and taste are never wanting. And when the presssure is on, he shows a technique which is breath-taking as it is unostentatious. His intonation is faultless.

If you consider my estimate is rather encouraging to Stern, I can only advise you to hear the records for yourself. Particularly the last movement which I do not think Heifitz himself could have played better.

GLASGOW ORPHEUS CHOIR, conducted by Sir Hugh Roberton—"The Turtle Dove" (Folk Song) (arr. Vaughan Williams) and (a) "Far Away" (Londonderry Air); (b) The Old Woman (Robertson). HMV EB.375.

One of the finest choral recordings I have ever heard. It sounds suspiciously like an FFRR type. The balance of basses and higher voices, the recording characteristics of the hall, and general definition are outstanding.

Musically, the arrangements I thought most interesting, not always the case with such well-known tunes as the "Londonderry Air." If you have a good amplifier, this record will give you exceptional realism.

RECORDS TO REMEMBER

GINETTE NEVEU (Violin) and THE PHILHARMONIC ORCH. Conducted by Walter Susskind—"Concerto in D Minor, Op. 47" (Sibelius). HMV ED. 484/7.

I can only register complete agreement with all that has been written about this recording. It is truly a remarkable one. From a musical point of view it could have been written only by Sibelius, who is as uncompromising in his music as he is in the demands he frequently places upon the soloist.

There are frequent reminders of his symphonies to be heard, but the approach is that of a true concerto—the violin is an essential part of what is being said.

In fact it is possibly the most vital and urgent voice to be heard in any concerto to the present day.

Its range in the musical scale, in emotional power, and in sheer dynamic conception, is colossal. So much so that the wonder is a woman should emerge so triumphantly from the experience of playing it.

For it is scarcely possible to criticise any aspect of the performance, so completely has the artist identified herself with the music. And you must hear it played to appreciate the task involved in such an apparently simple statement. It is simply impossible to play this concerto merely as a thing of beats, bars and crotchets.

It is strange that the two performances of the concerto which have moved me most have been with woman soloists, the other being Guila Bustabo, who gave such a memorable performance many years ago in Sydney.

I have never heard any of Ginette Neveu's records before, and it may be that she will never play another concerto as she does this one. Personally I would be surprised if her Brahms or Beethoven would reach the same plane. But having heard her Sibelius, frankly, I wouldn't be worried.

I assure you that this set is a tremendously important one. It simply cannot be overlooked either as a performance, for your interest in the achievement of a marvellous violinist, or your appreciation of a really great concerto.

ISAAC STERN (Violinist), with Alexander Zakin (Piano). Sonata No. 7 in C minor (Beethoven). Columbia LOX-600-603.

I have already commented on
of Stern in the Wieniawsky conce

Here he is heard in vastly diff
—one of Beethoven's best known ar
best sonatas. There is much mor
to bite upon in such a work, part
an artist, for there are few displa
with which to dazzle. I do not
opinion often held that these ear
are comparatively easy to play
contrary, they call for great skill
dynamics, and musical proportion.

The second movement is a goo
of this, the third also but in a ver
manner. Here you will find full v
to form and phrase in fine lines
and meaning.

The uniform worth of the pe
however, makes it rather unfair
any section rather than another.

The general approach to the wor
and vital. Co-operation with the
pianist could scarcely be better, a
they have the same ideas on th

As a rule, I am not overkeen
sonatas. But I assure you I'll play
as all first rate performances des
played.

The eighth side carried a smoot
Handel Scherzo from the D Maj

Technically the records are
without being brilliant, and quit
play. They are not particularly forw
possibly accounts for somewhat t
tone in places.

ISOBEL BAILLIE, Soprano.—"A
is an Evil Plight" and "With
Unsheltered Moor," COLUMBIA.

I'm afraid her voice is a little
for music of this type, although
good enough idea of what is b
These are perhaps the best record
nically I have heard of Isobel Bai
alone will command them to man

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may not be as spectacular as so
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Fiedler's Sinfonietta—"Concerto in
for Organ and Strings" (Corelli-
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Strings and Organ" (Corelli). HMV

These are delightful records,
for the sincerity of their approach
manner in which the spirit of the
been preserved. Blend and balanc
lose in music of this type, are w
I thought them excellent.

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ANSWERS TO CORRESPONDENT

UNDER THE PERSONAL SUPERVISION OF THE TECHNICAL ED

J.D.W. (Albury, NSW) gives us details of his callsign and location and says he has received many useful ideas from "Radio & Hobbies."

A. Thanks for your letter J.D.W., and we are very happy to know that "Radio & Hobbies" is proving acceptable to yourself and other readers.

H.R.I. (Caulfield, Vic.) asks us about an infinite impedance detector which he saw in an overseas publication.

A. The circuits you refer to are not radically different from the one you have apparently been using. This latter is based on the same principle using a large amount of negative feed back in the cathode circuit. However, it does give a small amount of gain. Taking the output from the plate side sometimes simplifies matters in regard to instability. However, there is no harm in trying the two circuits and you may find that they will give slightly better quality than the original one but with reduced gain.

R.S.R. (Quairading, WA) sends in his subscription to "Radio & Hobbies" and says he has built up the "Springtime Portable" and the dual-wave "Vibra-five."

A. Thanks for your subscription, and we are pleased to note that the two receivers are proving so satisfactory.

F.R. (Albert Park, Vic.) sends in an advertisement and asks whether we plan to describe a "Signal Tracer" in "Radio & Hobbies."

A. It is quite likely that we will do so sooner or later although we cannot indicate exactly when this may be. As for our set designs, we do not spend overmuch time on specialised circuit arrangements as the proportion of readers who want to build such sets is relatively small. We must also be influenced by the safety factor involved by some designs and the degree of complication which we believe could be tolerated by our readers.

W.P.S. (Toowoomba, Qld.) reports having built up the "All Wave Battery Three" using other valve types.

A. There would be no need to modify the circuit, except perhaps that you could try returning the grid resistor of the second valve to earth instead of to the back bias network. You could try this scheme if you like. Connecting the condenser between the centre of the feedback network and earth would render the feedback inoperative and increase the gain. However, the quality might suffer as a result. There is no objection to operating the receiver this way if you are keen to do so, but it is seldom that the full gain of the audio system is necessary.

H.W.L. (Peterborough, SA) sends in his subscription to "Radio & Hobbies" and suggests that we should publish more details on flying model aircraft.

A. Thanks for your subscription and we note your interest in flying models. We have not deliberately discontinued articles of this nature but it so happens that the material available of late has been of another type. We will be quite happy to publish further flying model articles if and when they come to hand.

K.E.R. (Brisbane, Qld.) has completed the 1946 D/W "Advance" and says it performs very well on both broadcast and short-wave bands.

A. Thanks for your report on the set, K.E.R., and we are glad to know that it is proving so satisfactory.

J.J. (Bankstown, NSW) says he has built up "Little Jim II," receiving all the local stations and one from Newcastle.

A. It is impossible to make any general rule about the performance of these small sets as so much depends on the location and the amount of time you spend on the controls. Local stations tend to fill up the band pretty well, but you may get surprising results by using a large aerial after some of the locals have closed down. However, your 150 ohm phones are far too low in impedance to expect best results. Phones of at least 2000 ohms impedance are essential if you want the best out of the set. You cannot expect too many hours operation from a single torch cell as the filament supply. You would do better to use a larger 1.5 volt battery or several cells in parallel. The B battery should give several months of service. There is no immediate prospect of the broadcast band DX page being published again.

L.McR. (Barcaldine, Q.) reports having built up the "1Q5-two" receiver but has had no success with it.

A. Assuming that you are using a large aerial and good earth you should be able to hear whistles from several stations at night, almost irrespective of your location. The fact that you have received no evidence of signals indicates that the receiver is inoperative, due to either a faulty part or some error in the wiring. We have no idea as to whether your location is good or bad, but would not suggest the addition of an R.F. stage until you find out what is wrong with the set in its present form. You cannot expect the addition of an R.F. stage to correct an error.

K.W. (Sandringham, Vic.) says he has built the "1Q5-one" with good success.

A. Glad to note that the receiver is operating well. You could try it on the short-wave by arranging for plug-in coils and winding suitable coils for the short-wave band. However, it may be necessary to experiment quite a deal with the reaction winding to obtain reliable operation with the rather low plate supply voltage.

B.H.A. (Ivanhoe, Vic.) says he has built up many of our small receivers and has been able to assist his school friends in getting their sets into operation.

A. Thanks for your letter, B.H.A., and we are pleased to note your success with our small circuits. Provided the capacitance range of a tuning condenser is of the correct order—say from 15 to 400 mmfd, or thereabouts—it will operate with any of the standard commercial coils. However, other type gangs are not likely to track accurately with a dial calibrated for the Stromberg H, and the DA-7 dial is one of these.

L.K.M. (Warburton, Vic.) comments on the "1K5-Four" receiver, and suggests that we should describe a battery-operated Communications receiver for country listeners and amateurs.

A. Your suggestion is a good one, L.K.M., but we have not yet been able to tackle the job of designing a set of this nature. Your change of address has been duly noted.

J.W. (Redhead, NSW) says he constructed the "1Q5-two" receiver but did not obtain any better results than from the "Little Jim's Mate" receiver using a 1J6G.

A.: Actually "Little Jim's Mate" is equivalent to a two valve set since it uses a twin triode and has two distinct stages. Nevertheless we would hardly expect it to be quite as good as the "1Q5-two" operating on equal voltages, since the latter set uses two sensitive pentodes. There is really little we can suggest to do to a set of this type apart from the ordinary experiments with aerial, earth and coil design. Sorry that we cannot undertake to reply by post unless you enclose the query fee.

R.V.F. (Naracoorte, SA) writes in appreciation of our "PA-3" amplifier which he has used for providing dance music.

A.: Many thanks for your letter and we are delighted to know that the amplifier is performing so well. The construction of a magnetic wire recorder is not as simple as it might at first appear while there is the immediate problem of obtaining suitable wire. We cannot offer you any assistance in the matter just now.

F.C.C. (Brisbane, Qld.) notifies his change of address and expresses keen interest in the "1947 Senior Radiogram."

A.: We have recorded your address and future issues will correctly through the post. Your could be fitted with a transforme an impedance similar to that of speaker, and connected between plates with a series condenser t but the higher frequencies. The of this condenser would have to experimentally to make the sm operative only on treble passages.

K.D. (Broken Hill, NSW) than information supplied through query service and says that he a of coils to his dual-wave receiver data given for the "Communicati 40-metre band.

A.: Many thanks for your lett note with interest the success you the "Communciations Nine" coils. the fact in case it is of interes readers.

W.D.R. (Largs Bay, SA) was pl the "Springtime Portable," but su a really tiny portable is overdue.

A.: We agree that many readers interested in a midget portable, bu been waiting until small parts bec able in quantity before running t tion of such a set. There is littl devoting a lot of space to an el which only a few readers could

A.G.B. (Marshdale, NSW) suggest should devote a lot more space to h also to very elementary radio beginners.

A.: Many thanks for your letter, read with interest and your vario tions were noted. Despite our inc we are still hard put to it to publ features that our readers ask fo ing the vibrator supply you could the unit described at some lengt "Vibra-Four" and "Vibra-Five" It could be used equally well with of similar nature.

K.L.B. (Devonport, Tas.) sends i cuit of a one-valve receiver for p in our "Reader Built It" page.

A.: Many thanks for your letter been filed for future reference.

R.R. (Cheltenham, Vic.) sends of his transmitter and location.

A.: Thanks for your letter and your suggestion about circuits f operated transmitters. We may b assist you with circuits of this later date although there is re interest just now in vibrator powe ment. Glad to note that the 2J proved so successful.

C.M. (Maryborough, Qld.) ment severe noise occurs in his receiver gas bath heater is turned on.

A.: Many thanks for your lette have passed it on to the contrib writes "The Serviceman Who Tel are not imagining this as it can happen, but enough just now. We it to the contributor mentioned more fully with the matter.

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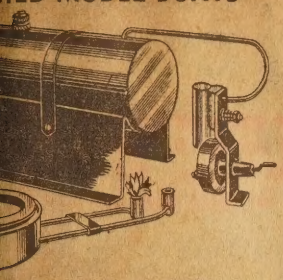

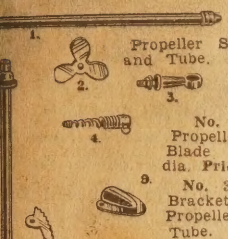

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ANSWERS TO CORRESPONDENTS

J.L.T. (Kogarah, NSW) is another reader who likes the "Springtime Portable" but suggests that we could now describe a receiver much smaller in overall size.

A.: What you say is essentially true but we have not done this to date owing to the scarcity of the small components to which you refer. However, the supply position is looking brighter and a new portable should not be too long in coming.

A.S. There is nothing to stop you purchasing these crystals or, for that matter, any other transmitting equipment, provided you do not actually use the equipment to emit a radio signal. By all means spend any available money now in equipment which will be useful at a later date if it is available so cheaply. As far as we know you will still have to obtain the usual licence for your receiver but suggest that you check on this point with the PMG Department. Yes, we can supply circuits for the "Communications Four" and "Communications Five" receivers through the postal query service.

R.F.P. (Balaklava, SA) sends in his subscription and advertisements to "Radio and Hobbies" and says he had good results from the "All Wave Battery Three."

A.: Many thanks for your subscription, and it was hard luck to have the receiver burnt so soon after completion. Better luck next time.

P.O.K. (Bacchus Marsh) has built up "Little Jim's Mate" but finds that consistent operation is obtained only when the hand is held on the reaction control.

A.: This sounds very much like hand capacity, which should not be present in this set to that extent. Make sure that you have earthed the rotor assembly of the reaction condenser and not the stators. As far as your second set is concerned it seems obvious that the reaction circuit is not working, as otherwise you would hear heterodyne whistles on stations. Try reversing the connections to the reaction coil and any other of the schemes which were suggested in the recent articles on regeneration. Regarding the licence position for shortwave receivers, we suggest you contact the PMG Department.

E.T.M. (Riverstone, NSW) added a half-wave rectifier to his DC meter and found that the readings were very low.

A.: The major cause of the trouble is that you are attempting to use a half-wave rectifier, whereas a full-wave rectifier would be essential to make the readings correspond more closely with the deflection on DC. Even so, the deflection will be only 0.9 of that obtained on a corresponding DC voltage. This point was explained at length in the articles covering the "Checka-meter." It is also possible that your rectifier may be faulty, which will further aggravate the trouble. It is quite in order to use anything up to a 5 mill rectifier on a 0-1 milliamp meter.

A.T.G. (Perak, Malaya) sends in his subscription to "Radio & Hobbies" and says he hopes to be on the air soon from the present location.

A. Many thanks for your subscription and we will be interested to receive a copy of your QSL card. Maybe we will have the opportunity of chatting to you over the air on some future occasion.

V.S. (Yorketown, SA) has constructed a version of the Vibra-Five receiver to operate from the 240 volt D.C. power mains.

A. We read with interest your remarks about this receiver, but are at a loss to understand your suggestion that a by-pass condenser on the second 1M5G grid produces a bass tone control effect. In that position it would actually tend to detune the I.F. amplifier seriously, thereby greatly reducing the gain and selectivity. To use a pickup with this set you can follow out the scheme employed in the "Vibragram 7" recently described, although there would be no point in your case, in breaking the high tension supply to the first three valves. There is no particular objection in connecting two D.C. generators in series, provided there is good insulation between the output terminals and the frame. It would not be satisfactory to connect A.C. generators in series unless they were mechanically coupled to deliver an in-phase voltage at all times.

N.C. (Trafalgar) was apparently rather put out by another reader's criticism of our suggestions from the "junk" box. He feels that most radio enthusiasts have to rely quite a deal on their stock of spare parts.

A. Many thanks for your letter N.C., and we are glad to note that you are getting good results from the "Amateur Junior" receiver. To apply full AVC to this set would involve dropping the leaky grid detector, but it is in order to follow out the simple scheme used in the "2JU-Five" receiver. But it is possible that the control on very strong signals would not be adequate to prevent a blocking effect in the grid detector, hence the effect you mention.

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ANSWERS TO CORRESPONDENTS

H.W.T. (Rose Bay, NSW) reports having added an RF stage to the "1Q5-Two" receiver with good results.

A.: Many thanks for your report on the set H.W.T., and we trust that it will continue to give you much pleasure during the coming months.

R.H.T. (Taringa, Q) sends in two years' subscription to "Radio and Hobbies" and comments generally on the magazine.

A.: Thanks for your various comments, R.H.T., and we are pleased to note that you like "The Serviceman Who Tells" feature. Quite a few other readers have commented on somewhat similar lines on the re-introduction of these articles. Calvin Walters' articles are likewise an essential feature of the magazine, though they have little connection with the subject of radio. We doubt whether we can oblige in the matter of the cover design.

D.L.E. (North Unley, SA) asks whether an 80 rectifier could be used in place of a 5Y3-G in the "Vox Minor" amplifier.

A.: The two rectifiers are electrically identical so that the 80 could be used with no more than a change to the socket. Your "Tex" receiver should certainly be more sensitive than it apparently is, but it is difficult to suggest just what may be the trouble. Assuming that all the components and connections are in order, the important thing is to have the regeneration operating smoothly. If you cannot put the set in and out of oscillation on all stations try reversing the connections to the reaction coil and/or increasing the number of turns.

V.H.A. (North Perth, WA) has been experimenting with the "1946 Little General" and finds that more sensitivity is available when the aerial is bridged across to the control grid of the converter valve.

A.: It is significant that you were using only a very short aerial when you made these tests. Connecting a large aerial in this way would possibly increase the signal strength but very much at the expense of selectivity. The real error was in expecting the set to give of its best with only six feet of aerial wire in use. This receiver has no audio amplification ahead of the output valve so that any measure which is likely to increase the signal voltage on the diodes may give the effect of increasing volume. Thus removal of the AVC would apparently have this effect but it could lead to severe distortion on strong stations. Elimination of the AVC does not increase the absolute sensitivity and there should in any case be plenty of volume for all ordinary requirements with the gain turned full on. The intermittent noise in your other receiver could easily be caused by faulty valves.

J.A. (Wangoom, Vic.) is very keen on short wave reception and building short wave receivers.

A.: Thanks for your letter and your kind remarks, J.A. We hope you have plenty of success with your short wave activities.

A.J.V. (Warrnambool, Vic) sends in his call sign and gives an outline of a receiver which he proposes to construct.

A.: Thanks for your letter and for the report on the "Amateur Junior" receiver. We can quite understand that the performance would be improved by the additional valves but, as we were careful to state in the original article, the receiver was built with the definite idea of restricting the number of parts and the complexity. You will have quite a job on your hands stabilising the proposed new receiver with its two RF stages and three IF stages. The important thing to realise is that extra valves do not necessarily mean improved performance, since the limiting factor is signal to noise ratio in any large receiver. We suggest you read carefully the article about the "Communications Nine" receiver which has proved to be a very effective set with more than ample gain. However, good luck with the project.

W.R.S. (Bingara Plantation, Qld.) renews his subscription to "Radio and Hobbies" and says he finds much of interest in our circuit designs.

A.: Thanks for your subscription and for your encouraging remarks. We note your suggestion about more articles on high frequency equipment and we will probably be showing increased activity in that field in the near future.

J.H. (Melbourne, Vic.) sends in an idea for producing oscillation in a receiver to allow CW signals to be copied.

A.: Many thanks for your letter and for the hint which we will probably republish in the "Reader Built It" section.

DON'T FORGET GRID BIA

We are often requested through our query service to comment circuits which readers have sketched out for themselves. Some commendable efforts, others just the reverse. But it is amaz just how many overlook the need for grid bias on the valv

GRID bias essentially serves two functions. First of all it controls the operating characteristics of the valve and ensures proper amplification of the signal. Secondly, it limits the plate current of the valves to the prescribed figure, thus protecting both the valves and the power supply. This latter factor is particularly important in the case of power output valves.

By way of example, a 1L5-G battery pentode draws a total plate and screen current of 7.5 milliamps under the ordinary conditions of 135 volts on plate and screen and 4.5 volts bias. But omit the bias voltage and the total plate and screen current soars to about 20 milliamps. Just imagine how this affects the life of the valves and batteries, not to mention the distortion which is introduced.

The grid bias voltage necessary for a valve depends on its type, the class of service and the operating potentials on plate and screen. The only way to be sure of every case is to check up on published valve data.

Power valves need the most attention in this respect. Look up ratings for the valve type and see what bias is stipulated for the particular plate and screen voltages you propose to employ. Then provide for the appropriate bias in your circuit.

The bias for other stages often calls for more careful consideration, although the results of omission may not be as serious in terms of excessive current drain.

PLATE VOLTAGE

There is seldom any doubt about the plate and screen voltages for RF and IF amplifier valves, or of audio stages employing transformer coupling. The coil windings which provide the plate load have only moderate d-c resistance and the plate voltage can usually be reckoned as being equal to the high tension supply.

Checking on the operating conditions for typical RF amplifier valves will usually show a grid bias of between -1.0 and -3.0 volts for a-c operated valves, while many battery RF pentodes operate with zero initial bias. This does not negate the previous statements. It simply means that the manufacturer has designed the particular valve to operate with zero initial bias.

Even if the RF and IF amplifiers are controlled by an AVC voltage, it is still necessary to arrange for the appropriate minimum bias in the a of a signal. Failure to do thi cause the receiver to block up a come very insensitive.

Where valves are used with resi coupling, the effective plate volt very much less than the supply vo plate current is usually less th milliamp and the required bias i much reduced. Ordinary class amplifier ratings do not apply fo condition.

The beginner cannot be expect understand the whole technique sistance-coupled amplifier design the above remark should at least confusion which arises about th parent discrepancies. In the cho plate, screen and cathode resis or direct bias voltage—it is be follow established design practic the particular valve type.

DETECTOR STAGE

Bias is vitally important in the o tion of a detector. The so-called bend or plate detector is delibe overbiased to the point of plate c cut-off, and this operating condition duces the necessary rectifying act the plate circuit.

Grid detectors, on the other must necessarily operate without bias to allow the grid to rectify s in the appropriate fashion. The current is limited to reasonable portions by using resistance coupli by limiting the voltage applied thro transformer to something usually than 50 volts.

Finally, there is the matter of "B" power amplifier stages. valves, like the 19 and 1J6-G, specially designed for this service can be operated with zero grid Even so, the ratings for the 19 operating conditions using a small grid bias giving somewhat lower put power but with greater econon high tension current.

But don't entertain the idea that "B" operation necessarily infers zero operation. The 30 or 1H4-G requir less than minus 15 volts on the to reduce plate current to the c point appropriate for class "B" o tion. Any attempt to use these v as zero-biased class "B" amplifiers soon ruin the valves and the batteri

Yes, you may be hazy on the su of grid bias, but don't ignore it. bias is very, very necessary.

K5 THREE

ntinued from Page 53)

ne gain just enough to defeat ency and, at the same time, the quality of reproduction tput valve. If you want the gain from the receiver, the an be omitted altogether, but be replaced if there is any to unsatisfactory operation. ases the set will have all the n necessary with the resistor -and that is the way we in- set to be used.

ng the receiver operated sat- as a two-valve set, there no trouble in obtaining im- sults from this larger version. heck the circuit over care- re you switch it on.

nonth we will describe the in the construction of the ly, the addition of the R.F. is done, the receiver will con- the 1K5-Four design, as ori- scribed.

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